

PUBLIC WORKS

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Tarvia surface treatment at Cullman, Alabama



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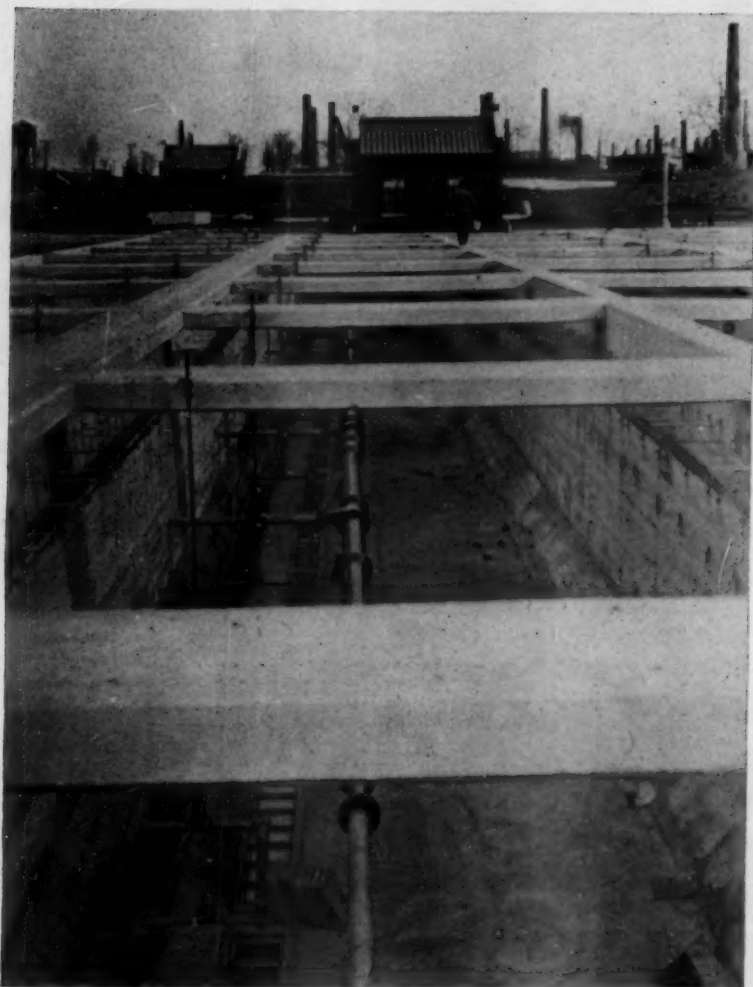
Montreal Toronto Winnipeg Vancouver

POSTPONING needed road improvement merely increases the expense to all concerned. Poor roads save no one any money, or time. There is no calculating what they cost business and farmers in lost profit and opportunity—or taxpayers and motorists in inconvenience.

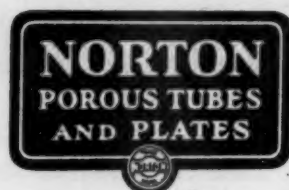
Take advantage of the few remaining weeks before winter sets in. Whether you have new roads to build, old roads to surface or widen, or patching to be done, there is always a

fast and economical way to do them with Tarvia. Tarvia economy includes low first cost and low up-keep, as well as speed of completion. Tarvia is made only by The Barrett Company, America's oldest and most experienced manufacturer of coal-tar road-building materials. All of Barrett's unmatched facilities for prompt delivery and dependable service are available to you through the Tarvia field man. Phone, wire or write our nearest office.

OCTOBER, 1933



Plans and specifications by
H. P. Jones and Co. of
Toledo. Construction by
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In Another Modern Sewage Disposal Plant . . .

NORTON Porous Plates—proven by years of use in cities all over the country—were selected for Lima's activated sludge sewage treatment plant . . . a part of this Ohio city's sanitary improvement program.

Strength and uniformity are the important factors in porous plates used for the aeration of sewage. And both are provided in Norton Porous Plates . . . for back of them are years of experience in manufacture and in applying porous mediums to sewage treatment processes.

R-465

NORTON PRODUCTS—Grinding Machines; Lapping Machines • Grinding Wheels; Abrasives for Polishing; India Oilstones, Pulpstones • Laboratory Ware, Refractories; Porous Plates • Non-slip Tiles and Aggregates

Construction through the PWA at reduced costs is the answer to your unemployment problems and to your needs for highway, water, sewerage or refuse.

Who can obtain the 30% grant and/or loan? Any city, county, township or district is eligible.

What is the procedure? Make your plans; get approval of the State PWA engineer—address on page 5.

How long does it take? See special information on pages 3, 4 and 5.

Must the work be done by contract? Not necessarily.

If you have any questions regarding the Public Works program, or how cities, counties or other communities can obtain aid, write, telephone or telegraph Public Works Magazine. We have made it our job to keep informed, so that we can give our readers and our industry the latest reliable information.

How to Get Federal Funds for Municipal, County and Other Work

UP to October 1st, 1933, allotments from the Public Works fund amounted to \$1,653,591,410. Of this amount \$174,627,569 is for non-federal projects, and it is the purpose of the Administration that most of the remaining billion and a half go to such projects.

Non-federal projects approved up to the 2nd of October total 179, of which 95 are for grants and loans, and 84 for the grant only. In addition, there have been some 3,500 federal projects approved, and 2,000 highway projects in another class.

Applications are coming in more rapidly now than at any time in the past, and extraordinary efforts are being made to speed these through, so that men may get to work before winter interferes—if it will be allowed to interfere.

Necessary Steps in Approval of Projects

On most water and sewer projects initiated by a municipality through the city engineer or a consulting engineer, approval of the project must be given by three authorities: By the state sanitary engineer, in accordance with state laws; by the state PWA engineer; and by the PWA in Washington. On highway work, bridge and other construction, state approval is not required, and the plans should first be taken up with the state PWA engineer, and then with the PWA in Washington.

Formerly state sanitary engineers required from 2 to 6 weeks to approve a set of plans. This has been speeded up very materially in almost every state, and while no set time can be given, since this will vary with the complexity of the plant to be built, with the special features of design to be adopted, and other factors, most states are prepared to give quick general approval of plans. In some cases this can be done in 24 to 48 hours.

The next hazard is the state NRA engineer. While the state board of health is generally most concerned with the adequacy of the project so far as the engineering features of design are con-

cerned, and the suitability of the type of plant chosen for the local conditions, the PWA engineer is more concerned perhaps with the preliminary examination in regard to the requirements of Bulletin No. 2 of the Public Works Administration.

The Neck of the Bottle—Sometimes

In some cases the state PWA engineer represents the neck of the bottle—generally through no fault of his own. This is due to a number of factors, among them being that some of the offices were late in being organized and were immediately confronted with a pile of a hundred or more applications which had to be examined carefully; that almost the entire burden of referring the plans back to the engineer for further information falls upon this office; and also that, despite the thousands of engineers out of work and available, it is not possible to build up an organization over night.

While this is not true of some of the states, it is a fact in others that delays of as much as 30 days occur from time of presentation of the plans until they are forwarded to Washington for action by the PWA. There may be considerably less delay in cases where a grant only and not the loan is required.

This unfortunate delay, which is due

in some measure to the conscientious thoroughness of the state PWA engineer ought to be eliminated and we believe it will be eliminated just as soon as possible. A larger personnel, more experience in the work, the elimination of past accumulations of applications and other factors are already at work for an improvement. Greater care on the part of the city or consulting engineers in preparing applications will also expedite handling.

Speedy Handling at Washington

Examination of the records covering a large number of projects indicate that not more than 8 to 11 days elapse from the time the application is received at Washington until the loan and grant are approved. This is for the average run of project. Others may take more or less time. An example, perhaps outstanding but also illustrative, is the following:

The city of Salem, Mass., with men out of work, wished a grant for certain street paving work. The mayor, with his technical officials, worked this up, had it approved by the State PWA engineer and brought it to Washington, arriving Saturday. The project was studied on Saturday and Sunday by the PWA, approved on Tuesday and men were at work Wednesday morning. This propo-



Highway construction, possible with PWA Funds, gives employment.



Modern sewage treatment plants, as well as sewers, water lines and improved water supplies, give employment, add to property values and are often revenue producing.

sition was for the 30% grant only. If it had involved a loan as well, there would have been some further delay, because of financial and legal considerations.

Notes on Procedure for Grants and Loans

Bulletin No. 2 outlines the data that must be provided with each project. This should be followed in detail. Projects must be presented in triplicate, since at the PWA office at Washington the projects are studied simultaneously by the engineering, legal and financial divisions.

The advisory boards located in each state are administrative offices almost solely, and the state PWA engineer is the important officer to work with.

The Washington offices in the Interior Building, 6th floor, are open to all and the maximum amount of help is available in advising as to procedure, giving assistance, etc. However, it is desirable that, to the fullest extent, projects follow the routine already described above.

Elaborate Plans Not Required

It is stressed and emphasized that, so far as the PWA is concerned, elaborate and detailed plans are not necessary. Plans must be sufficiently clear to show that the whole proposition is based on good engineering practice, but plans in the detail necessary for the award of contracts are not necessary for approval for grants or loans.

While construction by contract is generally preferred, this is not necessary. One of the reasons for the preference for contract work is that costs are generally known beforehand, while in force account work, frequently no control of costs is possible. Also it is believed that generally more economical work can be obtained by contract procedure.

Tentative approval of a project cannot be given with the idea that work can begin pending final approval. Tentative approval can be given and the money allotted for a period of 30 days, subject to withdrawal of the allotment if work has not begun, but the money cannot be used until final approval has been given.

While cold weather construction is possible in most lines of work, even though

occasionally at a slightly higher cost, it will be permissible to begin work on a part of a project this fall—for instance, sewers, water lines or highway grading—and continue in the spring when weather conditions are favorable with the remainder of the work—sewage treatment plants, water purification plants, highway surfacing, etc.

However, every effort should be made to continue construction throughout the winter period. That is the time when relief is most needed, and with proper direction and control of the work, winter construction is entirely possible. Some articles on winter construction will appear in forthcoming issues of PUBLIC WORKS.

Speeding Up the Work

Drastic steps have been taken already by Secretary Ickes to speed up the work, the most notable being in regard to the construction of secondary roads, which will be discussed later. Other constructive suggestions are welcomed.

PUBLIC WORKS has suggested that the NRA committees, which have been formed in practically every community in connection with the observance of codes and similar work, be enlisted in an effort to sell the PWA program to their communities. There is no doubt that these local men, if given the responsibility of doing so, would be a tremendous force in getting projects past the "talk" stage. It is felt that the greatest impediment to quick action by many communities is not poverty of the city or county, nor even a non-realization of the needs and the opportunities, but a simple feeling against spending money as such.

Local influence and local opinion, as represented by the NRA boards already set up, which comprise generally leading men in every community, will have a far greater effect in overcoming this feeling than anything else. The organization is already perfected, and it should be used. Directions from PWA headquarters are necessary to accomplish this.

Where municipal debts are limited by state laws, the PWA is not able to help. That is, it is not a superforce that can set aside state laws. In fact, it may function

only by using existing state laws and regulations. Therefore, when a municipality has already reached its constitutional debt limit, it cannot go further except in certain cases.

These exceptions are generally in regard to revenue producing projects, such as waterworks, electric light plants, and self-sustaining sewer projects, as where sewer rentals are chargeable under state laws. These exceptions obtain in some 26 states which have passed such laws.

Highway Funds

Of the Public Works fund, \$400,000,000 was early allotted to the states for highway construction. These grants were made on a liberal basis and without requirements for matching funds, as in previous federal aid work to the states. Detailed regulations have been published by the Bureau of Public Roads regarding the use of the major part of these funds.

Information was given in the August issue of PUBLIC WORKS regarding the amounts allotted to each state. These amounts are essentially correct in all cases. Approximately one-fourth of the total, or \$100,000,000, has been set aside for secondary road construction. A similar amount will be used for constructing federal aid highways through municipalities, and the remainder will be used on highways and related projects on the federal aid highway system of each state.

On the latter, which will be principally the so-called high-type, or hard surface, highways, contract construction will be almost the general rule. This will also be the case in the federal aid highways through municipalities. But it will not be the general rule in secondary road construction.

Force Account Work

It is the intention of the PWA to hasten the beginning of these projects as much as possible. With contract work, surveys must be made, plans and specifications prepared, bids advertised and the contract awarded. This takes time. With force account work, all this is not necessary on the types of roads which will be constructed under this program. In fact, it will be generally possible to do the work without surveys, plans or specifications, but simply in accordance with present practices in the construction of such types. Retread or mixed-in-place surfacing, for instance, is generally placed on existing highways in order to carry a heavy volume of traffic, without dust, and at a low maintenance cost. The placing of a 2-inch layer of such material on an existing gravel or macadam road does not require preliminary plans or surveys.

Nevertheless, a mistaken idea has existed that such work will be done solely by contract. Officials of the Bureau of Public Roads have stated that such is not the intention, and a statement issued October 2 by Secretary Ickes goes still further in the matter. This statement is to the effect that all regulations which might slow up the program are abandoned temporarily. Effective at once,

states may begin work without first presenting plans, without awarding contracts and without advertising for bids. States under this ruling are allowed to prepare plans "simultaneously with the beginning of the work."

In effect, it is believed that this order will result in most of the work for several months, especially so far as secondary road work is concerned, being done by force account.

It should be remembered that counties, cities, villages, towns, etc., are eligible to receive grants for highway work. Therefore, the \$400,000,000 state highway allotment does not, by any means, represent the total available for highway work.

State PWA Engineers

ALABAMA—None
ARIZONA—Howard S. Reed, Phoenix
ARKANSAS—Alex Allaire, New P. O. Bldg., Little Rock
CALIFORNIA—Frank E. Trask, State Bldg., Los Angeles
COLORADO—George M. Bull, 229 Custom House, Denver
CONNECTICUT & RHODE ISLAND—Leslie A. Hoffman, Hotel Stratfield, Bridgeport
DELAWARE—Chas. H. Fleming, State House, Dover
FLORIDA—James E. Cotton, Tallahassee
GEORGIA—J. Houston Johnston, 722 Citizens & Southern Bk., Bldg., Atlanta
IDAHO—Ivan C. Crawford, State House, Boise
ILLINOIS—Joshua D'Esposito, U. S. Court House, Chicago
INDIANA—Albert H. Hinkle, 401-D Fed. Bldg., Indianapolis
IOWA—P. Frank Hopkins, State House, Des Moines
KANSAS—Robert J. Paulette, Topeka
KENTUCKY—Robert V. L. Wright, 267 Fed. Bldg., Louisville
LOUISIANA—Orloff Henry, 714 Masonic Temple, New Orleans
MAINE—Geo. M. Williamson, Portland

MARYLAND—Abel Wolman, 1245 Balt. Trust Co. Bldg., Baltimore.
MASSACHUSETTS—Charles R. Gow, 307 State House, Boston
MICHIGAN—Mortimer E. Cooley, 10 Fisher Bldg., Detroit
MINNESOTA—William N. Carey, 1246 Univ. Ave., St. Paul
MISSISSIPPI—Geo. H. Wells, 241 Edwards Hotel, Jackson
MISSOURI—Hugh Miller, Buder Bldg., 7th & Mkt. Sts., St. Louis
MONTANA—D. A. McKinnon, Fed. Bldg., 219, Helena
NEBRASKA—Albert C. Arend, 420 Fed. Bldg., Omaha
NEVADA—With Utah
NEW HAMPSHIRE—Vt. — Harold J. Lockwood, State House, Concord
NEW JERSEY—Cornelius C. Vermuele, Jr., Indus. Bldg., 1060 Broad St., Newark
NEW MEXICO—G. M. Neel, Santa Fe
NEW YORK—Arthur Tuttle, Capitol, Albany
NORTH CAROLINA—Herman G. Baity, Chapel Hill
NORTH DAKOTA—S. D.—Harry C. Knudson, Fed. Bldg., Devils Lake
OHIO—L. A. Boulay, Wyandotte Bldg., 6th floor, Columbus
OKLAHOMA—Philip S. Donnell, Fed. Bldg., Oklahoma City
OREGON—Claude C. Hockley, Fed. Bldg., Portland
PENNSYLVANIA—Wm. H. Gravell, Cap. Bldg., Harrisburg
RHODE ISLAND—With Connecticut
SOUTH CAROLINA—J. L. M. Irby, Columbia
SOUTH DAKOTA—With N. Dakota
TENNESSEE—Harry S. Berry, Nashville
TEXAS—Robt. A. Thompson, Fair Bldg., Fort Worth
UTAH—NEVADA — Richard Ambrose Hart, Fed. Bldg., Salt Lake
VERMONT—With N. H.
VIRGINIA—James A. Anderson, 337 P. O. Bldg., Richmond
WASHINGTON—Gene Hoffman, Olympia

W. VIRGINIA—M. Lindsay O'Neale, Charleston
WISCONSIN—James L. Ferebee, Madison
WYOMING — Francis C. Williams, Cheyenne
HAWAII—Stanley L. Scott, Honolulu
ALASKA—Dr. Philip S. Smith, Alaskan Div. Geological Survey
PUERTO RICO—Col. Francis J. Behr, C. A. C., San Juan

Personnel of the Federal Emergency Administration of Public Works, 6th Floor, Interior Bldg., Washington.

Administrator

Hon. Harold L. Ickes, Secty. of Interior

Deputy Administrator

Col. Henry M. Waite

Executive Officer of P. W. A.

Major Philip B. Fleming

Executive Assts. to Deputy Administrator

Major Robt. W. Crawford

Col. E. W. Clark

General Counsel for Legal Division

Henry T. Hunt

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Director of Housing

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What Others Have Done Is What You Can Do

The following list of allotments by the Public Works Administration up to Sept. 30, shows the varieties of public works projects that have been granted to cities, villages, counties and towns. Your community can and will receive the same consideration.

Montgomery, Ala., Waterworks	\$ 70,000
Arab, Ala., Waterworks	23,000
Texarkana, Ark., Bridge Repairs	20,000
Sacramento, Calif., Water System	11,700,000
State of Colorado, Road Construction	10,000,000
Norwalk, Conn., Water System	70,000
Ft. Pierce, Fla., Power Plant	36,000

Uniontown, Ala., Waterworks	6,000
Lewiston, Idaho, Replacing Water Mains	5,000
Springfield, Ill., Waterworks	1,385,000
Springfield, Ill., Electric Power Plant	78,000
Sylacauga, Ala., Waterworks	100,000
Morrison, Col., Waterworks	20,000



Pahokee, Fla., Water System	100,000	Springfield, Ohio, Sewer System	905,000
Petersburg, Ind., Water System	50,000	Salem, Oregon, Waterworks	1,500,000
Davenport Bridge Comm., Iowa, Bridge	1,446,000	Colome, S. D., Waterworks	25,500
Republic County, Kansas, Surfacing Highway	5,000	Spanish Fork, Utah, Waterworks	80,000
Republic County, Kansas, Surfacing Highway	3,000	Madison, Wis., Sewer System	912,232
Saylorsville, Ky., Waterworks	42,000	Madison, Wis., Relief Sewer	21,100
Evanston, Ill., Water System	250,000	Madison, Wis., Storm Sewer	16,800
Rosiclare, Ill., Water System	115,000	Madison, Wis., Storm Sewer	40,300
Warrenton, Ga., Waterworks	6,000	Madison, Wis., Storm Sewer	7,800
Des Moines, Iowa, Street Widening	6,400	Madison, Wis., Sanitary Sewer	5,600
Des Moines, Iowa, Sewer System	80,000	Kamas, Utah, Waterworks	12,500
Des Moines, Iowa, Street Repair	5,500	Proctorville, Ohio, Water and Sewage System	58,000
Des Moines, Iowa, Sewer System	4,300	Tooele, Utah, Waterworks	50,000
Des Moines, Iowa, Wooden Culvert	300	New Castle, Wyo., Waterworks	20,000
Huntingburg, Ind., Waterworks	84,750	Triborough Bridge Authority, N. Y., Bridge	44,200,000
Beach Grove, Ind., Sewer System	37,000	Port of N. Y. Authority, N. Y., Midtown Hudson Tunnel	37,500,000
Louisville, Ky., Sewage System	290,000	Fremont, Ohio, Sewer System	325,000
Des Moines, Iowa, Paving	4,000	Sandy City, Utah, Waterworks	14,000
Pocahontas, Iowa, Paving	6,000	University of Iowa, Repairs to Bldgs.	8,000
Bel Air, Md., Sewer System	125,000	University of Iowa, Repairs to Bldgs.	57,000
Salem, Mass., Street Construction	34,800	Cleveland, Ohio, Sewer System	8,990,000
Dubuque, Iowa, Street Work	7,000	Spearfish, S. D., Waterworks	41,000
Dubuque, Iowa, Street Work	20,000	Cleveland, Ohio, Incinerator	194,000
Dubuque, Iowa, Street Work	1,200	Madison, Wis., Bridge	17,500
Dubuque, Iowa, Street Work	3,000	Madison, Wis., Storm Sewer	21,900
Dubuque, Iowa, Street Lighting System	6,300	Madison, Wis., Sanitary Sewer	3,100
Dubuque, Iowa, Storm Sewer	8,000	Milwaukee, Wis., Sewer System	1,850,000
Marlborough, Mass., Sewage System	25,000	Fort Atkinson, Wis., Sewer System	18,315
Clear Springs, Md., Sewer and Water System	23,000	Green Bay, Wis., Sewer System	723,000
State of N. H., Bridges	220,000	Oshkosh, Wis., Sewer System	968,000
Vienna, Md., Sewer and Water Systems	27,000	Waupaca, Wis., Sewer System	65,000
Detroit, Mich., Docks and Sewer Systems	21,000	Crete, Neb., Sewer	8,100
Omaha, Nebraska, Water and Gas Plant	290,256	Kennett, Mo., Sewage	38,000
Franklin County, Iowa, Street Repair	85,000	Union, Iowa, School Bldg.	3,000
St. Paul, Minn., Street Work	87,180	Toledo, Iowa, Street	2,500
Clarkton, Mo., Waterworks	20,000	Ames, Iowa, Storm Sewer	9,000
Northport, Mich., Waterworks System	33,000	Ames, Iowa, Sewage	6,000
Ft. Benton, Mont., Waterworks System	45,000	Cedar Rapids, Iowa, Sewage	683,160
St. Louis, Mo., Sewer System	104,000	Boone County, Iowa, Construction	12,000
Detroit, Mich., Street Repair	300,000	Toledo, Iowa, Sewage	2,500
Minnesota Lake, Minn., Water System	2,750	Story County, Iowa, Highway	14,100
Hampton, N. H., Sewage System	160,000	Dallas County, Iowa, Secondary Rds.	32,000
East Brunswick, N. J., Waterworks	60,000	Newton, Iowa, Sewage	10,000
Warroad, Minn., Bathing Beach Improvement	5,000	Emmetsburg, Iowa, Waterworks	6,500
Pleasantville, N. J., Sewer	27,000	Cedar Rapids, Linn Co., Iowa, Secondary	5,000
Fargo, N. D., Sewer	524,000	Pocahontas, Iowa, Storm Sewer	900
Manchester, N. H., Reservoir	250,000	Stoughton, Wis., Waterworks	16,000
Valley City, N. D., Sewer	77,000	Republic County, Kan., City Rd. Impr.	4,000
Albert Lea, Minn., Improvements to Water Mains and Streets	6,000	South Omaha, Neb., Bridge	1,650,000
Shenandoah, Iowa, Filtration Plant	38,000	Massillon, Ohio, Intercepting Sewer	160,000
Cincinnati, Ohio, Sanitary and Storm Sewer	160,000	Albert Lea, Minn., Repaving & St. Widening	167,000
Cincinnati, Ohio, Sewage and Drainage System	8,850	Tama, Iowa, Storm Sewer	6,000
Cincinnati, Ohio, Enlargement of Sewage System	8,750	Iola, Kan., County Poor Farm	5,500
Cincinnati, Ohio, Street Widening	27,000	Anchorage, Ky., Street Construction	25,000
Merrill Water Co., Oregon, Waterworks System	17,000	Atchison, Kan., Concrete Paving	800
North Kingston, R. I., Water System	110,000	Atchison, Kan., Resurfacing City Street	6,500
Belle Fourche, S. D., Water System	30,000	McPherson, Kan., Elevated Water Tank	3,500
Orangeville, Utah, Water System	9,000	Oklahoma City, Okla., Sewer	16,500
Poulsbo, Wash., Sewage System	18,568	Oklahoma City, Okla., Street Construction	
Eau Claire, Wis., Water System	250,000	Curbs Stones	12,900
Cleveland Metropolitan Park District, Ohio, Park Development	650,000	Republic County, Kan., City Rd. Impr.	3,200
		Cleveland, Ohio, Water	800,000
		Cleveland, Ohio, Sewage	135,000
		Norwalk, Conn., Road Const.	14,000
		Easton, Conn., State Highway	23,000
		Oklahoma City, Okla., Water	1,500



Pat. Pending

An improved Self-cleaning Bar Screen which insures an efficient and thorough screening of sewage. Completely automatic in operation.



Two Single Unit Grit Channel Conveyors are shown above. The most efficient method of grit removal.



Interior view of primary settling tank looking toward effluent end, showing sludge collecting flights on tank bottom and returning flights on upper runway acting as skimmers.

Cut Sewage Disposal Costs with....

Proven Equipments.

To operate your plant efficiently and at low cost it is important that you select the right kind of equipment.

From the diversified line of equipment for Sewage, Garbage and Refuse Disposal Plants and Light and Power Plants, Jeffrey Engineers can and will help you select the right unit to do your job efficiently and economically.

Some of the proven equipments offered by Jeffrey to lighten the burden and to speed up sewage and garbage treatment processes are shown here. These and others are completely described in our New Bulletin No. 545-B. Send for it today.



THE JEFFREY MANUFACTURING COMPANY

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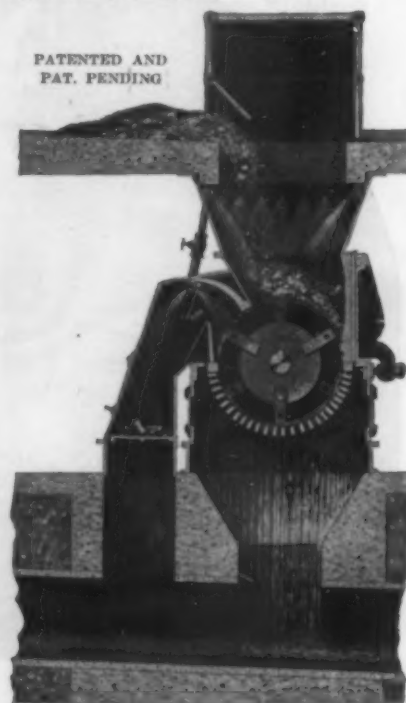
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PAT. PENDING



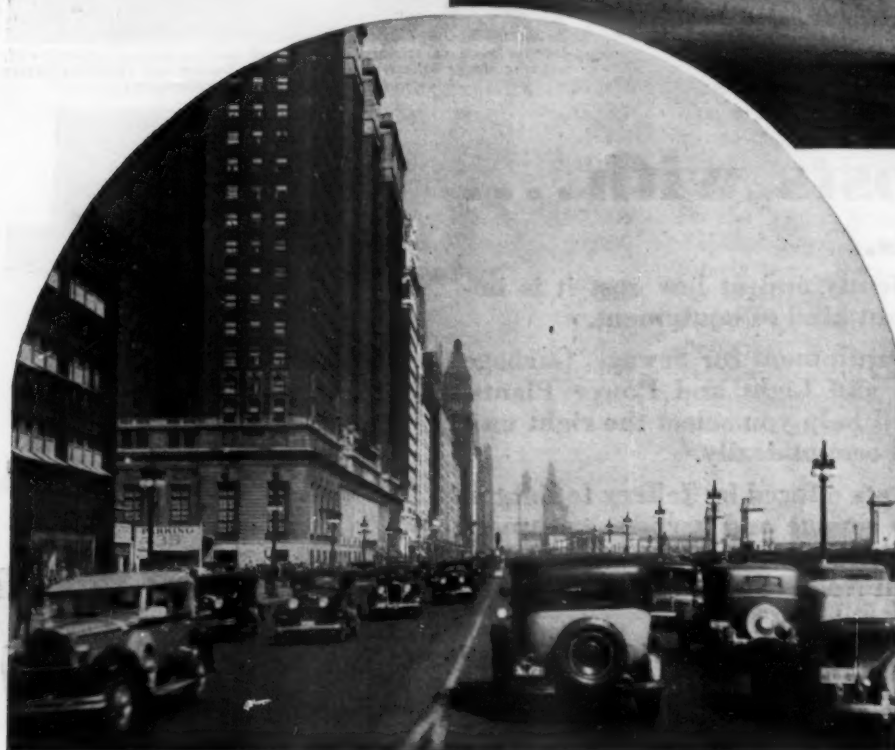
Cross-section view of New Jeffrey Sewage Screenings and Green Garbage Grinder. An entirely new process to easily and inexpensively dispose of screenings and garbage by grinding, after which it is discharged into the sewerage.

When writing, we will appreciate your mentioning PUBLIC WORKS

You Should About the Road



Laying $\frac{1}{2}$ inch surface of Stanolind Cut Back Asphalt and aggregate on Michigan Boulevard during July, 1929. One half of the street was paved, then the other half, without stopping traffic.



Michigan Boulevard today, showing the good condition of the pavement. It is estimated that 61 million vehicles have traveled over this boulevard since the Stanolind Cut Back Asphalt surface was laid.

ASPHALTS FOR EVERY PURPOSE

When writing, we will appreciate your mentioning PUBLIC WORKS

Know the Facts Material You Use

CUT Back Asphalt can be manufactured with many grades of materials but Stanolind Cut Back Asphalt is paving asphalt cement and diluent, the proper products for best results.

The paving asphalt is a pure high-grade cement which meets the standard accepted specifications. It has the highest cementing qualities.

The diluent is not simply distillate oil, but a special product having the correct boiling point requirements to give the delayed initial set necessary for permitting mixing on the roadway and complete final set which allows the paving asphalt to return to its original consistency.

The half-inch surface of Stanolind Cut Back Asphalt and aggregate on Michigan Boulevard, Chicago, demonstrates the wearing ability of the Cut Back Asphalt Cement. For four years this thin surface has been handling the traffic on the world's most heavily traveled street.

STANDARD OIL COMPANY

(INDIANA)

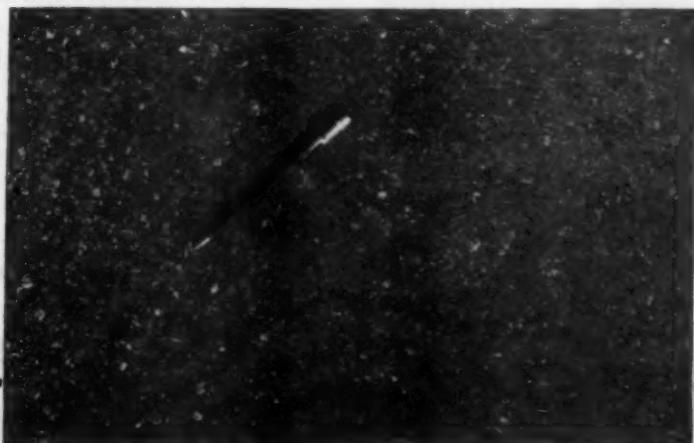
122-C

910 South Michigan Avenue

Chicago, Illinois



Newly laid surface of Stanolind Cut Back Asphalt and aggregate on Michigan Boulevard, Chicago. This picture was taken just before this particular section was opened to traffic. Notice how thoroughly the asphalt has covered the stone. This is necessary for good binding.



Stanolind Cut Back Asphalt surface on Michigan Boulevard today. Notice how the aggregate has bonded together by the cementing qualities of the asphalt.





Cold weather coming... But

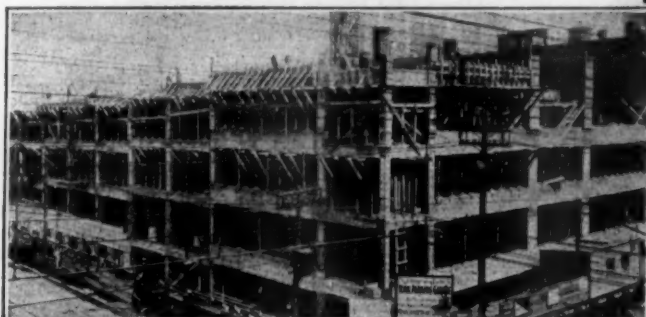
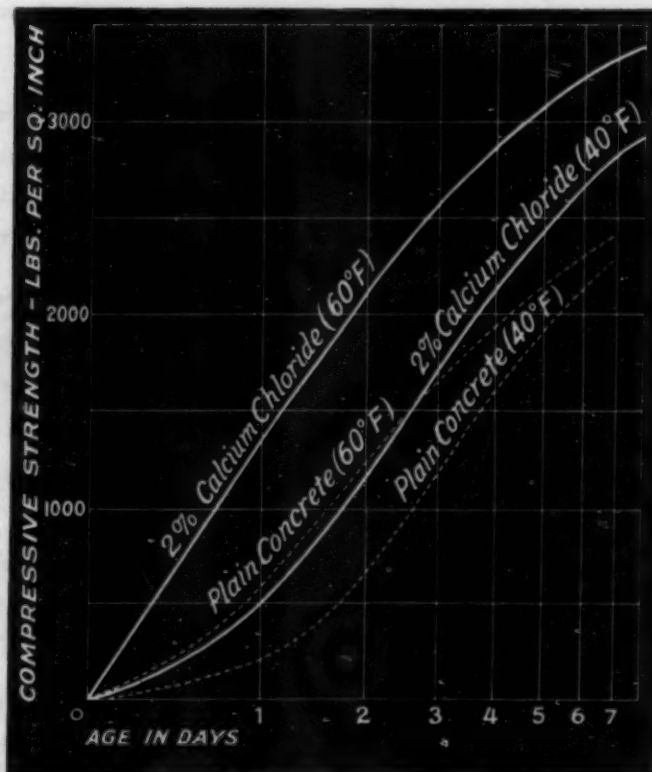
CONCRETE CURED WITH CALCIUM CHLORIDE CAN "TAKE IT"...

The use of Calcium Chloride in the concrete mix permits a "year-round" construction period and eliminates the necessity of seasonal "lay-offs."

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CALCIUM CHLORIDE • for modern concrete curing

October
1933

PUBLIC WORKS

Vol. 64
No. 10

CITY, COUNTY AND STATE ENGINEERING AND CONSTRUCTION

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BRAINSTORMS

Serious and quite numerous complaints have been received that *Brainstorms* take too much of the time of some of our readers. Be calm, gentlemen—and ladies, for we have some female *Brainstormers*, too. We are merely doing our part as an uninvited, unofficial and possibly unwanted member of the Committee for the Better Utilization of Useless Time, which is a part of the NRA program.

And from Dover, N. H., "You can't loose me, Shar-ley! And you're doing fine since the Kingfish went away. Those fellows down in Pine Bluff, Ark., are pretty fair on *Brainstorms*. Wonder if they're getting any regular work." Thanks, Col. Wheeler, we're always glad to hear from you and sorry to know that the city hall burned up there in your town. How about that query, you folks down in Pine Bluff?

Getting down to business, we're going to run just one or two more of those Pine Bluff Teasers. The Kingfish hasn't yet reported, the hunting season up here is about to open, and time is short.

(a) An easy one for our junior members: Transposing the last digit to the front results in a number four times the original number. What is the number?

(b) And for the senior class—or maybe the post-graduates: Remove the last digit, quadruple and transpose to the front of the original number, thus having nine times the original number. Now what number has this charming and possibly valuable quality?

Sidestepping the Solutions:

Now the only trouble with this series of *Brainstorms* is that if we give the solutions to last month's problems, we will practically have the answers to this month's, since all these problems operate under the same blanket code. They also have certain peculiarities all their own. For instance, the solution of the "two" problem mentioned last month contains 18 digits, with every digit appearing twice except 0 and 9. The same is true of many others. But—a tip—the answer to (a) above contains only 6 digits.

Walter S. Wheeler of N. H. sends in solutions to last month's problems which we haven't had full time to check, as yet. However, he starts off for the first problem as follows: Let y be the number required; a , the base, exclusive of the last figure, and n , the number of digits in base a .

Go to it, gentlemen.

W. A. H.

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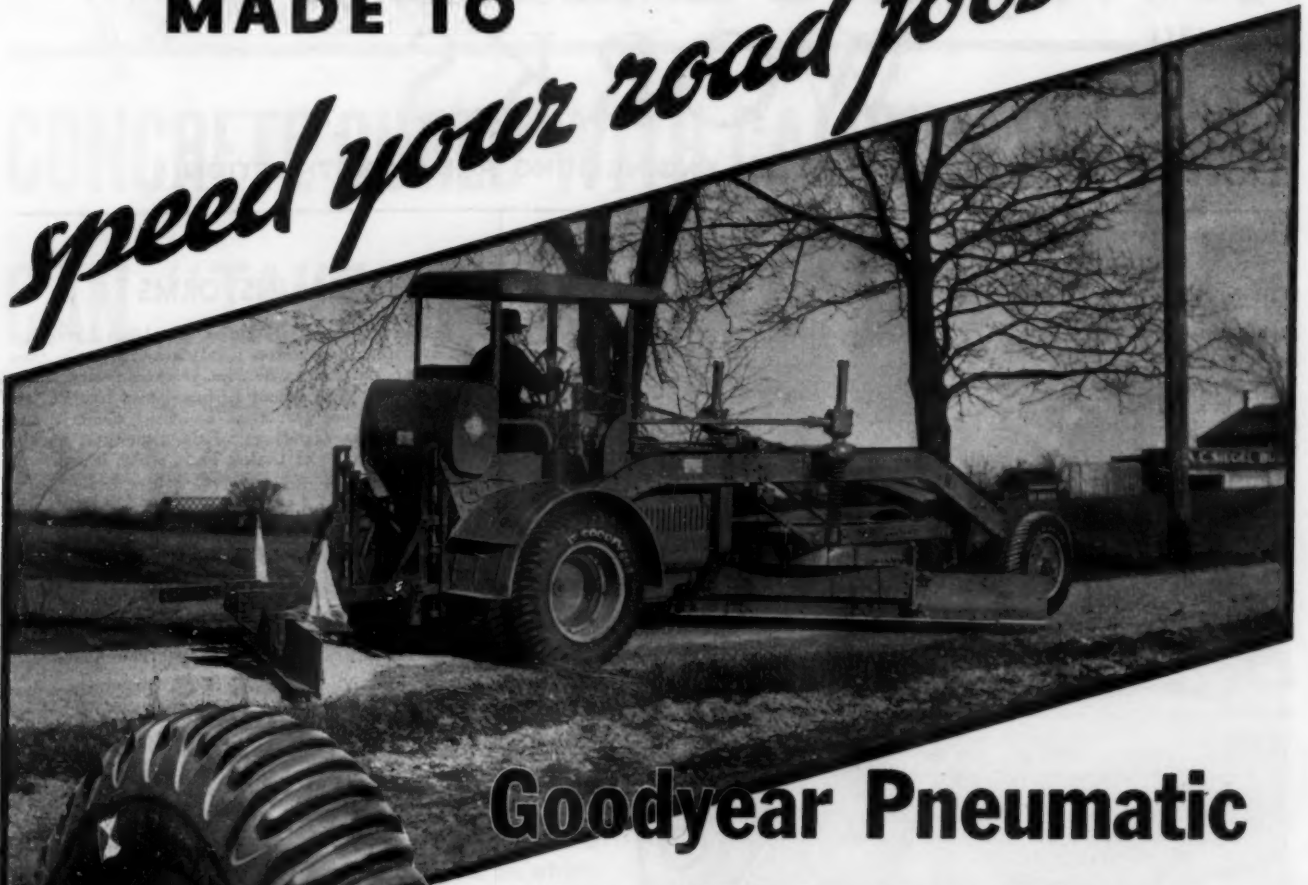
A. PRESCOTT FOLWELL, *Editor*

W. A. HARDENBERGH, *Asso. Editor*

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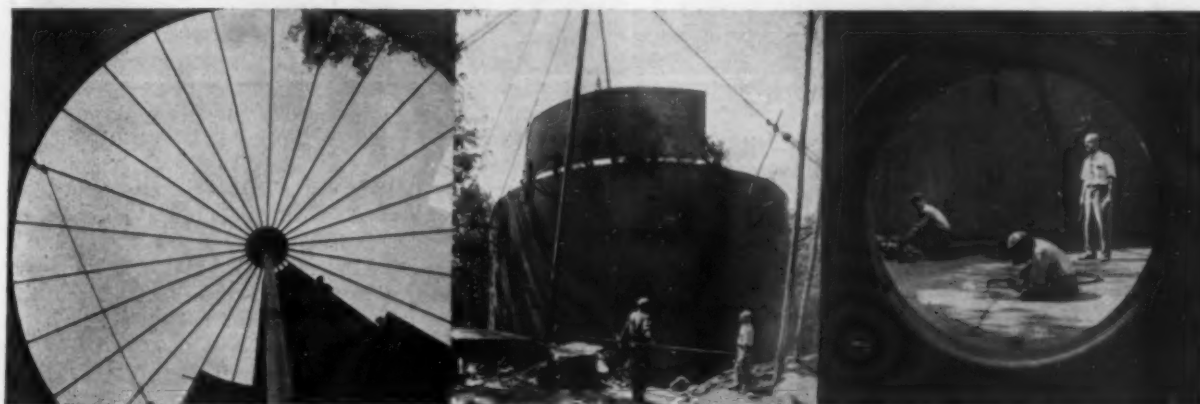
PUBLIC WORKS

City, County and State Engineering and Construction

Vol. 64

October, 1933

No. 10



Looking up from the inside showing construction of conical roof.

Placing a plate in position with pole and sheet buggy.

A glimpse through the manhole showing welding of the bottom.

Electrically Welded Standpipe at Lake Mohawk

*Forty-one and a half feet diameter and thirty-six feet high
built at two-thirds the cost of a riveted tank*

PERHAPS the latest development in standpipe and water tank construction is the substitution of welding for riveting. An example of this is a standpipe built this summer at Lake Mohawk, Sparta, N. J., in connection with a water supply which serves 530 homes, two hotels, and restaurants, business center, etc.

Lake Mohawk is a private development on a lake $3\frac{1}{2}$ miles long by $\frac{3}{4}$ mile wide made by damming Wallkill brook. During the seven years since this was started the water supply has grown from a spring feeding seven houses through $2\frac{1}{2}$ miles of pipe, to an artesian well yielding 550 gallons per minute which was built this year by the Arthur D. Crane Co., which water is pumped 2,000 feet into the electrically welded standpipe referred to and distributed through 27 miles of mains.

This standpipe is 41 ft. 6 in. diameter and 36 ft. high to the top of the shell, on which is a conical roof rising 3 ft. 6 in. higher. The capacity is 364,320 gallons. It has an 18 in. manhole in the roof and another in the shell 3 ft. above the bottom, near which is a ladder both inside and outside. There is a flange for a 6 in. intake connection in the shell near the bottom, a 6 in. overflow at the top of the shell, and a 3 in. screened vent on the top center of the roof.

The flat bottom is of $\frac{1}{4}$ in. steel plates, and the roof of No. 10 steel. Of the five rings in shell, the bottom ring is $\frac{3}{8}$ in. steel, the second is $\frac{5}{16}$ in., the third $\frac{1}{4}$ in. and the fourth and fifth $\frac{3}{16}$ in. All seams are lap welded—not a single rivet was used in the construc-

tion. The bottom of the tank is perfectly flat. The first course rests on it, welded both inside and outside with no reinforcement. The shell courses are telescoped into one another, large end up which facilitated welding, making all work "down welding." Allowance of $\frac{3}{4}$ " to 1" was made for lap.

Plates were raised into position by means of pole and sheet buggy. Temporary erection brackets were welded to each course about two-thirds the way up. Half-inch bolts were used at 3-foot intervals for fitting up purposes and laying up laps for welding. It was provided that these bolts could either be left in and the bolt heads welded all around, or be removed and the holes be filled with welding, at the option of the erector, and the former was chosen.

For welding, two 400 ampere welding machines were used. One gang of five men was employed in fitting up the tank and an additional gang of three for the actual welding.

The constructors, the Dover Boiler Works, inform us that no leaks have developed after eight weeks of service. Should any develop, they would be corrected by peining.

The tank was painted green to match foliage in the surrounding woods, which has proved to be much more attractive than the usual black.

Judging from their previous experience, the constructors find that the cost of fabricating and erecting a similar tank, but riveted instead of welded, would be 50 percent more than that of this tank.

Sound Unemployment Relief Through Highway Improvement In Port Jervis

PORT JERVIS, N. Y., with a population of 10,000, found itself facing the winter of 1932-1933 with 600 families, representing roughly 30% of the population, on the relief rolls. This situation was due to a number of factors, including the furlough or discharge of a number of men from the shops of the Erie railroads, and the reduction in forces of some small local factories. This article will detail some of the steps taken to solve the problem in a sound and common sense fashion.

The men unemployed were both skilled and unskilled, generally of a good type. Many of them had been conditioned by relief work on Skyline drive and in the construction of a reservoir during the previous winter and summer. The efficiency of these men was, therefore, pretty close to that normally expected of labor.

Handling the Relief Problem

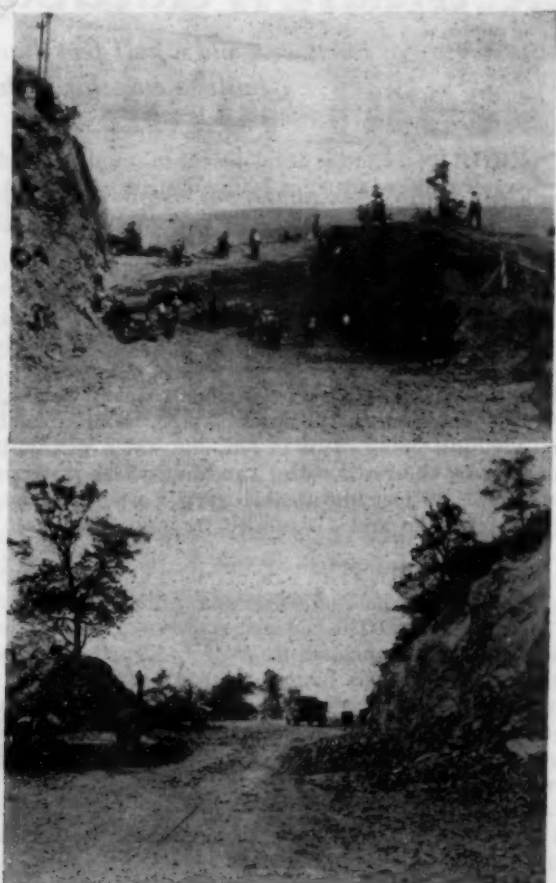
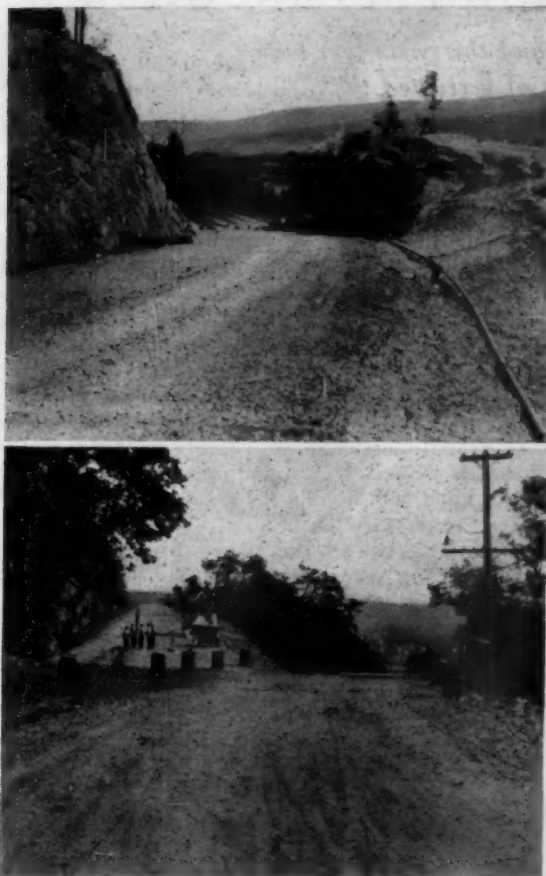
Through the regular relief organization set up in the city, every person or family applying for relief was recorded and a survey made. In general, unemployment relief work was limited rather strictly to those showing a residence of at least two years in the state and six months in the city; though of course relief measures had to be granted to some others to prevent suffering.

The survey showed what was necessary for each family or individual—how much was required for living. It also showed the income, if any, obtained through work or other means by any member of the family. The difference between these two amounts was the deficiency which had to be supplied. In general, 3 days of work of 8 hour shifts each, at 40 cents per hour was granted each family head, but each family was given the number of shifts each month which were necessary to meet the deficit. New budgets were made for each family each month to adjust any changes in the family income or expenses.

In granting relief, common sense governed. If a family already owned an automobile, the purchase of an occasional gallon of gasoline was permitted; but a man was not allowed to trade in his old car for a newer one. The general policy was based on the fact that the great majority of the people did not want charity—they wanted work. Therefore, any possible touch of charity was eliminated from the whole program.

The Project for Work

One of the northern entrances to the city is along the face of a mountain and the road is narrow and has poor alignment and grades. The work decided on was to cut a roadway—Park Avenue—through the shoulder of this mountain. In addition to the cut, which was al-



Some views of the project in various stages of completion.



Upper left picture shows beginning of work. Other views show construction under way and men at work.

most entirely in solid rock, the parkway is being paved. Contracts for this work have been let, and construction has begun. The contractor on this work furnishes the materials, supervision and equipment, while the city supplies the labor.

Estimated items in the work are given below.

Handling Men for the Work

Of the maximum of 600 men needing work, 50 were employed on state highway 3A, by agreement with the state. A few others were employed on other jobs and by other highway work from time to time. An average of 320 were employed on Park Avenue with a maximum of 400. Of the 600 men unemployed, about 200 were single men and 400 married men. These men were worked in two shifts, each of 8 hours a day, 3 days a week. With wages at 40 cents an hour, this meant \$9.60 per man per shift.

The actual construction work was done under the direction of George H. Bierlein, Superintendent of Streets, who estimated the man requirement. The Wel-

fare Department supplied these men. All payrolls were handled in accordance with the Temporary Emergency Relief Administration methods. Despite the large amount of work, the amount of administrative overhead was very small.

Construction Methods

The work was of a difficult character, involving a rock cut with a maximum depth of 50 feet. Drilling was done by use of air compressors. A couple of quarry men handled, with temporary assistants, all drilling and blasting work. These men and some 20 or 25 others worked full time, these generally being the 4 foremen, truck operators, tractor operators, engineers and assistants. The foremen were generally men personally known to the superintendent, Mr. Bierlein, and who had had previous construction experience.

In general, the rock was drilled by air-operated drills, shot, loaded into trucks by hand, and dumped into place. Tractors and graders were used to smooth

(Continued on page 36)

Item	Amount
Clearing and Grubbing	—
Earth Excavation	7,500 Cu. Yds.
Rock Excavation	7,500 Cu. Yds.
Rock Excavation	15,000 Cu. Yds.
Rough Grading	15,000 Sq. Yds.
Fine Grading	—
Concrete Pavement	—
Concrete Curb	5,300 Ft.
Parapet Wall	2,500 Ft.
Manholes	6 Ft.
Catchbasins	12 Ft.
18" T. C. Drain	2,500 Ft.
12" T. C. Drain	150 Ft.

Total Cost	Materials and Equipment	Labor
\$ 500	—	\$ 500
9,375	\$ 1,875	7,500
18,750	7,500	11,250
45,000	9,000	36,000
1,500	—	1,500
883	—	883
29,155	13,120	16,035
5,300	2,120	3,180
5,000	2,250	2,750
450	270	180
600	360	240
4,500	1,350	3,150
270	81	189
\$121,283	\$37,925	\$83,357

Sewage Treatment for Obtaining Park Irrigating Water

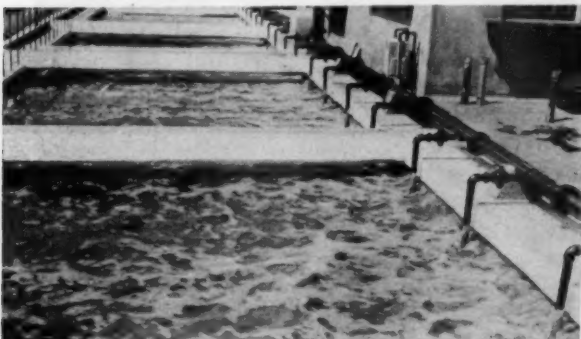
By Frank McQueen

Sewage Disposal Engineer, San Francisco, California

GOLDEN GATE PARK, in San Francisco, is one of the nation's most notable playgrounds. It comprises 1,013 acres and extends in a strip one-half mile wide from Stanyan Street, between Fulton and "H" Streets, three miles westward through one of the city's best residential districts to the Pacific Ocean.

The area covered by the park was originally barren sand dunes. Due to the vision, resourcefulness and indefatigable efforts, against seemingly insurmountable obstacles, of Dr. John McLaren, the park's first and only superintendent, these barren sand dunes have been converted into one of America's most beautiful and interesting show places. In the park there are museums, zoological and botanical gardens, monuments, an aviary, an aquarium, a Temple of Music, a stadium, tennis courts, baseball and football grounds, athletic field, running track, a paddock, bridle paths, artificial lakes, children's playgrounds and more than 25 miles of improved highways. But the most interesting feature of the park is, perhaps, its plant life. Domestic and exotic trees, shrubs and flowers are to be seen everywhere, growing in tropical profusion and luxuriance.

The average rainfall in San Francisco for the past fifty years has not exceeded one-half inch per month for the seven months between March and November, and for many years prior to the time when fine homes surrounded the park the vegetation was irrigated with sewage from an outfall sewer which traverses the park and empties into the outer bay. Of recent years, however, due to complaints of odors emanating from the sewage, potable water from the Spring Valley Water Company has been used exclusively for irrigation. This water was purchased from the water company by the park commission and on account of its almost prohibi-



Aeration Chamber, Golden Gate Park



*Sewage
effluent
flowing
down
Meson Lake
Falls*

tive cost the commission, in 1926, began consideration of plans for securing some economical means in keeping with the environments, both real and esthetic, for converting raw sewage into clean, odorless water, suitable for irrigation and sprinkling.

As a result of its investigations, the park commission finally adopted plans for the construction of an activated sludge sewage treatment works in the park opposite 33rd Street, near "H" Street. The plans were passed upon for the State Board of Health by Dr. Chas. Gilman Hyde, Professor of Sanitary Engineering at the University of California, and the work of construction was completed in July, 1932.

The sewage treatment works has a capacity for converting one million gallons of sewage per day into clean, clear, odorless water suitable in every respect for the purpose intended. The flow in the outfall sewer considerably exceeds a million gallons, but only this amount needed for irrigation is treated.

The various elements of the works are as follows:—

1. Primary Settling Basin, equipped with motor driven "Straight-Line" sludge collectors and scum removing devices.
2. Pre-Aeration Chamber (which is a section of the aeration chamber) in which the settled sewage from the primary settling basin is given 30 minutes' aeration prior to the introduction of the return activated sludge.
3. Aeration Chambers (two in series) which are of the Manchester "spiral flow" type. Air, under 2.6 pounds pressure, is introduced through porous tubes set 4'-0" below the surface of the sewage in the chambers in narrow channels formed by vertical baffles and one wall of the chambers.
4. Final Settling Basin equipped with motor driven "Straight-Line" sludge collectors.
5. Separate Sludge Digestors equipped with "Straight-Line" detritus drags for clearing the tanks—two in number—of sand and other inorganic matter. The digestors are provided with automatic scum and supernatant liquor eductors and a water-sealed gas trap. The gas evolved is metered and amounts to ap-

proximately 9,000 cubic feet per day. This volume of gas, if used in an internal combustion engine would create sufficient power to operate the pressure blowers and sludge collectors. Plans have been prepared for an automatic gas booster, gas holder and internal combustion engine for this purpose, but funds for this installation were not available. However, it is probable that it will be made during the coming year.

6. Sludge Drying Beds of conventional type for the natural drying of the ripened sludge.

7. Chlorinator and chlorinator basin for disinfecting the final effluent.

The sewage treatment works is neat and attractive in appearance and is compact and efficient. No objectionable odors are noticeable as a result of the operation of the plant.

The principal feature of the plant is the aeration system. Air under 2.6 pounds pressure is supplied by four positive-pressure Acme-Victor blowers, No. 715, each having a capacity for compressing 388 cu. ft. of free air per minute against 3 lbs. pressure. Due to the rather heavy character of the sewage, 1.95 cu. ft. of air per gallon of sewage is required, including the air required for one sludge lift. The period of aeration is 6 hours, including 30 minutes pre-aeration. The return activated sludge is not re-aerated, but a small quantity of hydrated lime is added to the return sludge to counteract the effects of the entrained carbon dioxide.

By the method of aeration used, the sewage in the chambers is rotated spirally at a velocity of approximately 2.5 ft. per minute and good surface wave action is created, thus insuring a maximum of atmospheric contact with the sewage.

The air diffusing elements, or porous tubes, are installed in units of four tubes suspended on 2" pipes which are connected to the air manifold by R. R. unions, so that any unit may conveniently be removed for cleaning without the stoppage of the plant, or blowers.

With this method of air diffusion, aeration is effected at a cost comparable with that of the most efficient mechanical aerators, and the operation is much more flexible.

The cost of operating the aeration system, taking electrical energy at 1c per Kw. hr., an operator at \$125



Meson Lake, Golden Gate Park, filled with sewage effluent

per month, and lime at 1 ct. a pound and chlorine at 8 cts., but neglecting capital charges, would be approximately \$10.60 per million gallons of sewage treated.

The dried sludge, which contains 3.08 p.p.m. of nitrogen, is used as a fertilizer and "filler" in the Park and is of definite value for the uses to which it is put.

Analyses of the raw sewage, final effluent and sludge follow. These data were prepared by Frank Giusto, graduate engineer of the University of California, under the supervision of Dr. Hyde, and were averaged over a period of 6 months.

Golden Gate Park Sewage Treatment Analyses

	Raw Sewage	Final Effluent
Total solids*	908 ppm.	360 ppm.
Suspended solids	410	10-15
Settleable solids	14.9 cc/liter	—cc/liter
B.O.D.	405 ppm.	10 ppm.
D. O.	—	1.7 ppm.
Chlorides	83 ppm.	83 ppm.
Alkalinity	273 ppm.	273 ppm.
pH	7.3	7.3
Relative stability	—	10 to 30 days
Fats and Greases	39 ppm.	—

SLUDGE ANALYSIS

No count on agar plate.

No gas with broth tubes.

CHLORINE RESIDUAL

Chlorine residual shows when 2 ppm. of chlorine are used.

*Includes inorganic solids.

So completely are odor and suspended matters removed that the effluent is used for lakes and waterfalls.

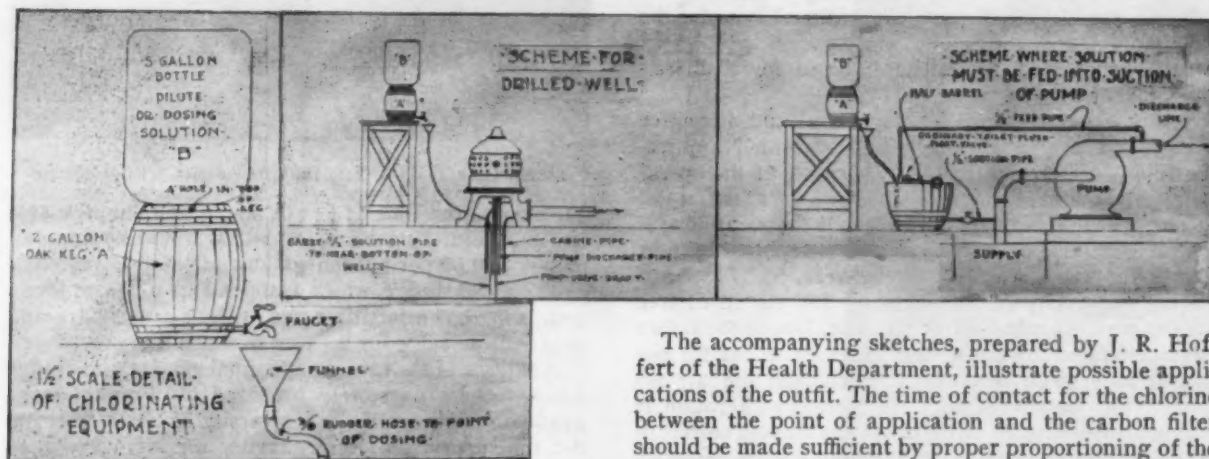
The Golden Gate Park plant was designed by Henry E. Elrod, consulting engineer, of Houston, Texas, and Pomona, California. The plant was constructed under the direction of the writer and Earl Clements, engineer and assistant superintendent of the park. The mechanical equipment was furnished by the Link-Belt Company, of San Francisco. The original estimate of the cost of the works was \$52,875, but the work was done by force account, to utilize "distressed" labor; consequently the ultimate cost of the works was somewhat in excess of the "contract" cost.



General view of Golden Gate Park Sewage Treatment Works

Simple Chlorination Equipment for Small Water Supplies

Major F. E. Daniels
Pennsylvania Department of Health



A GREAT many types of apparatus for chlorinating water supplies have been proposed and used. Many of these are expensive and the operation not easily understood; for those reasons supplies are frequently neglected when their safety could be assured at little expense if some simple device could be procured.

The writer has suggested the following outfit for small water supplies, temporary or permanent at camps, hotels, schools or other similar places. The materials are easily procured at a cost of only a few dollars at most, and the operation may be easily understood by any one.

The essentials of the outfit consist of:

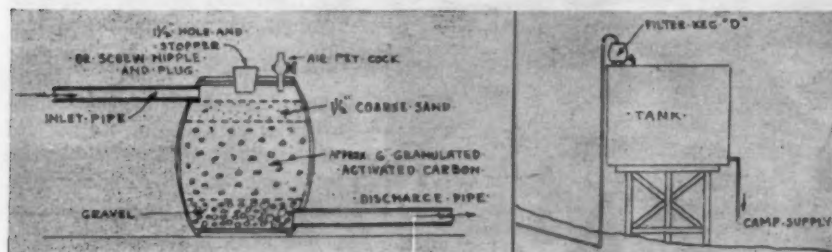
A five-gallon bottle of strong hypochlorite stock solution.

A five-gallon bottle of dilute hypochlorite dosing solution inverted over a 2-gallon keg with a small spigot to regulate the drip into the water flow.

A glass 100 cc graduated cylinder for measuring and two test tubes and a bottle of orthotolidin for testing the correct dose.

A 4-pound can of "HTH" or perchloron.

If desired, a small dechlorinating filter of activated carbon may be made in another 2-gallon oak keg containing "Nuchar" or other grade of activated carbon, placed in the line, preferably between the storage tank and the distribution, in order to remove any taste or odor which might be due to an over dose of chlorine or other cause.



Section of carbon dechlorinating filter

The accompanying sketches, prepared by J. R. Hofert of the Health Department, illustrate possible applications of the outfit. The time of contact for the chlorine between the point of application and the carbon filter should be made sufficient by proper proportioning of the length and size of the pipe between these points; the pump discharge should not be too great for the size of the dechlorinating filter. If the carbon filter is placed between the tank and a barrel or two connected to the distribution line, a small, uniform flow through the filter will be maintained, the barrels providing for an occasional sudden draft on the distribution line.

In many cases the carbon filter need not be installed, although it might be desirable on hotel supplies to safeguard against some objectionable taste in the water.

SIMPLE CHLORINATING APPARATUS FOR SMALL WATER SUPPLIES

Directions:

Saw a circular hole about 4" dia. in one end of the keg to hold the neck of a 5 gal. water bottle inverted over the keg. Screw in the brass spigot or petcock in the side of the keg near the bottom end, as shown. Set the apparatus in a convenient place so that the feed from the spigot will drop into a funnel leading to the water flowing to the storage tank.

Operation:

1. Put 1 lb. of "HTH" or perchloron in one of the 5 gal. bottles, fill with water up to the shoulder of the bottle, shake well to dissolve. This is the stock solution.

2. Place 125 C.C. of stock solution in the other 5 gal. bottle, fill with water a little above shoulder, shake well and invert on keg. This will make a constant head feeding apparatus and a bottle full will treat 1000 gal. of water with a dose of 0.5 P.P.M. chlorine.

3. If the drip is regulated to 12.5 C.C. per minute, the bottle will run for 24 hours.

4. 25 C.C. of such solution, more or less, increases or decreases the dose 0.1 P.P.M. per 1000 gallons.

5. Test the effect of the dose by adding 5 or 10 drops of orthotolidin solution in a test tube of the treated water. The color should be a slight to a distinct yellow. Vary the dose until this color is obtained on test.

(Continued on page 41)

THE EDITOR'S PAGE

Getting Action on PWA Funds:

That there has been unreasonable and unseasonable delay in getting PWA funds into service is generally admitted. Unreasonable because the reasons for delay have not been very sound in many cases, and unseasonable because winter is approaching, when need for relief is more intense than it is in the summer. Many of the reasons for delay may seem sound to the mayor or chief engineer, but it is doubtful if they appear quite so sound to those who have no income, yet must have food and coal to keep their families from starving and freezing.

Why this delay? There are numerous reasons or excuses. State laws, red tape, adherence to old methods, and the comfortable feeling that after all someone will see that these folks will not starve to death or freeze are among the reasons. Too many state highway departments have looked on their share of the \$400,000,000 grant simply as a means for filling in certain blank spaces that now show on the map of the state highway system. They have forgotten that the primary purpose of this money was to put men to work.

This is not a criticism of the PWA. That organization, after a hesitating start, has done very well. The government has no monopoly on red tape. It clutters up city halls and state capitols as well. In fact, we believe that most of the fault here lies elsewhere than at the national capitol.

Some one with both sense and humor has suggested that the \$400,000,000 allotment bill should have carried a provision requiring the states accepting their allotments to withhold all state highway salaries for a period beginning 30 days after receipt of the allotment and continuing until work had begun on projects amounting to 30% of the allotment. This is perhaps unfair to the numerous states that have gone diligently to work on the problem, but we must admit it would probably have secured action.

We are engineers and we understand the desire of the engineer to do a good job, but if the responsible engineers could realize the plight of those without a job, and feel the necessity those men are under, the work would be speeded up without a doubt.

Employment vs. Relief:

Perhaps many who have read the foregoing will say that it is better to expend relief money for doles than it is to do a half-way engineering job.

Well, neither is necessary. It isn't a choice between two evils. Nor is it necessary to start with the assumption that relief labor isn't good for anything except "made" work. That, too, is an error. If the engineers, authorized by the governors, mayors or other responsible officials, will use a fair part of their talents and a reasonable amount of energy, they can put men to work on sound projects, and get a reasonable return for the money spent.

In this engineers have an unusual opportunity to show leadership and ability aside from the common and ordinary routine of their duties. Let us hope that more and more take advantage of this opportunity. Let us hope that they remember the many differences between the

dole and useful employment. It costs just so much money for a man to feed his family and to live, whether this money is obtained with or without work. There are many reasons why it is preferable that this money be obtained in return for work.

In the first place, the feelings of the men must be considered. More than 90% of the men prefer work to idleness, though the net result may be the same—a barely living income. Second, in return for this money the community has something of value—something tangible and useful. Read the article on pages 14 and 15 of this issue.

What Is Real Relief?

A few more words on this relief problem. Money spent for this purpose can be used in one of two ways, speaking broadly. It can be eked out or doled out, a little at a time. This method accomplishes a certain degree of relief to those immediately participating in the work, but has no appreciable effect in creating a business revival or in aiding the country as a whole to recover from the depression.

The other method is a broader and better method. It consists in putting under way enough work on so sound a scale that everyone will benefit—labor, machinery manufacturers, materialmen, even unemployed engineers. All these rank among our taxpayers. Anything that will help them to prosperity will help the nation to far better times. This is the only worthwhile sort of relief.

Snow Removal for the Unemployed:

With the arrival of winter unemployment relief becomes more serious a problem for northern cities, and finding work for the unemployed more difficult. Among the seasonal jobs that offer is snow removal, and full advantage should be taken of it. All the snow handling machinery the city can afford should be used, for haste is important, but there will still be work for all the men who will apply for it if all roadways, gutters and sidewalks are to be cleared. In most cities the ordinance requiring property owners to clear sidewalks promptly, or else the city will do it at their expense, is not enforced. It should be, and owners urged to employ those needing work to do the clearing. And may there be plenty of snow!

A New Idea in Street Lighting:

The first ornamental installation of sodium vapor street lamps in the world (we believe) is now under way on Park Ave., Port Jervis, N. Y. This city is set in a tremendous bowl among the lower Shawangunk Mountains, and the golden halo from the new street lights will be visible for miles, from points in three states.

In these lamps, which if successful will open the way to tremendous development in general highway lighting, a consumption of 90 watts will produce as much as 4500 lumens of useful light. The lamps themselves act as rectifiers to produce the necessary direct current. Fuller details of this interesting installation will appear in an early issue of this magazine.

Low-Cost Oil-Surface Road in Arizona

THE completion of oil surfacing on Yarnell Hill, Phoenix-Prescott Highway, has resulted in many favorable comments regarding appearance and riding qualities. The road for several years before oiling had been under high class maintenance and the resident engineer did not alter the final grade and profile any more than necessary, except on line changes.

Good construction methods were followed throughout, from the treatment of the sub-grade to the actual spatting and placing of the traffic line. Following is a general report on methods of construction by W. J. Jamieson, resident engineer, which appeared in the August issue of *Arizona Highways*, official publication of the Arizona State highway department.

Federal Aid Project E-72-B is that section of the Prescott-Phoenix Highway beginning at the top of Yarnell Hill and extending to Congress Junction, a distance of 9.04 miles. This construction work was performed by the R. S. Hazard Construction Company at a contract cost of \$80,627.45.

Three changes of alignment were involved, one at Congress Junction, where two curves were eliminated; another at the foot of Yarnell Hill, where two curves were cut out; and the last at the top of Yarnell Hill, two curves being consolidated into one.

In all instances, the line of vision was considerably benefited, riding qualities improved and grade resistance lessened, despite the fact that the change at the foot of Yarnell Hill, over a short distance, increased the grade from 6 per cent to 7 per cent, the improved alignment affording greater car momentum, which more than offset the increased grade.

Major quantities involved in construction were 18,245 cubic yards of roadway excavation and borrow, 10,525 cubic yards of sub-grade stabilizer, and 16,335 tons of plant-mixed oil-treated surfacing.

Particular attention was paid to sub-grade. Where called for on plans, sub-grade stabilizer was placed to a loose depth of six inches; where re-conditioning was necessary, thickness varied depending upon sub-grade condition.

At the top of Yarnell Hill, for a distance of one-half mile, specifications for stabilizer were waived to allow the use of local material from a cut, thereby improving driving visibility and reducing overhaul. The contractor was not required to crush this material, which consisted of rotten shale and disintegrated granite, but after being laid in a six-course application, this was allowed to be compacted by traffic, then capped with 1½ inches of caliche.

Most of the stabilizer material was caliche with a small amount of disintegrated granite. In compacting stabilizer, best results were obtained by using water in the amount the material would absorb without waste, then placing a thin layer of stabilizer material on the top surface in order to prevent rapid evaporation, allowing it to stand overnight and then rolling.



Yarnell Hill and the new traffic-guided road

Several applications of water were sometimes necessary before the desired compaction resulted.

Rock was hauled from Congress Mine and sand obtained at the plant site, Martinez creek. The rock was hard and angular; it was put through a primary crusher at the dump, then broken down by a diamond crusher at the plant site.

Material for oil cake was held in the mixing drum a sufficient length of time to assure a thorough mix and thereby hold to a minimum any manipulation on the roadway.

An endeavor was made to keep the rock content of the oil-mix material to at least 50 per cent by weight. The asphalt averaged 4.12 per cent.

Mix was hauled from plant to roadside in trucks of seven tons capacity, then dumped from trucks into a mixing box, the box being drawn simultaneously by the truck dumping into it over the required spread. This assured a uniform mix, an even deposit, opportunity for rapid evaporation of the kerosene content and a smooth and rapid spread of windrowed material to the roadway surface.

Due to conditions that prevailed, asphaltic material remained in the windrow over various lengths of time; however, best laying results were obtained after a limit of 24 to 36 hours in the windrow.

The surfaced width is 20 feet on tangents and such additional width on curves as is consistent with roadway conditions.

On the line changes (new construction) curves were super-elevated to the maximum provided for such degree of curvature, but upon the original (old) grade such an attempt would have proved costly beyond the resulting benefits; even so, the super-elevation upon these curves is sufficient to meet the requirements of

(Continued on page 33)

Non-Corrodible Materials Are Desirable In Sewerage Construction

Aluminum, Bronze, Rustless Iron and other non-corrodible materials are found to have many advantages in preventing deterioration of such structures.

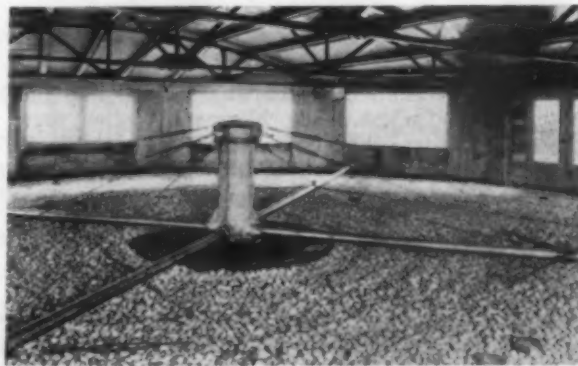
IN designing structures for sewerage and sewage treatment, engineers have become so accustomed to employing concrete and steel as the structural materials that they are apt to forget that other materials may be preferable for use under certain conditions or for special features of the design. These conditions include injurious effects of sewage and sewage gases on these materials, difficulty and cost of form work, inaccessibility for painting or repairs, etc.

For example, arches of concrete sewers have been destroyed by the action of acid due to sulphuretted hydrogen gas given off by septic sewage. Where this is considered possible, tile or other clay units may be used, either as the sole structural material or as a lining, even the cement joints being replaced with asphalt or other acid-resistant material. Or absolute tightness of sewer may be necessary, in which case iron pipe with lead or equivalent joints may be used for sewer mains and services.

A different type of example is suggested by the slabs which form the sloping bottom of the flowing-through channel of an Imhoff tank. These are thin and must be well reinforced; the form work for constructing them is expensive if built as solidly as it should be; and their tops should be trowelled to as smooth a surface as possible, and even then the sediment does not slide off as freely as desired. It is possible that economy of con-

struction and efficiency of operation might be furthered by constructing these slabs of wire glass supported at the joints by light beams of steel well protected against corrosion or by other materials that are themselves resistant to corrosion.

Several substitutes for ordinary steel have been used,



PFT "Rotary Distributor" at Sunnyside, Ind. Horizontal arms and central support of aluminum.

such as Armco and Toncan iron, monel metal, copper-bearing steel, also tin, nickel, brass, including the various "rustless" or non-corrodible irons and steels, aluminum, etc. Except for bronze, used for sprinkler nozzles, valves and other parts, perhaps the earliest uses of any of these was in the diffuser plate holders for the Gastonia, N. C., activated sludge plant designed by William M. Piatt in 1921 (described in *PUBLIC WORKS* of March 4th, 1922), who later used them in the Charlotte plant also, aluminum being used to prevent rust from the containers plugging the filter plates. Since rust particles from the inside of air mains may be carried to these plates, cast iron used for the larger pipes is usually coated inside and out with pipe varnish, while the smaller pipe and fittings are of wrought iron or chrome nickel iron, and aluminum alloy piping is suggested for these also.

The George B. Gascoigne Co., engineers, in 1930 tested the action of aluminum alloys under sewage plant conditions, and on the basis of these tests adopted this material for diffuser plate holders for the Chattanooga plant, using 3S4 aluminum sheet and 3S alloy; and 3/16 inch 3S4 aluminum plates were specified for the aeration tank baffles, approximately 5,000 pounds of aluminum being used in this plant. In the additional treatment plant for Cleveland, designed by this firm of engineers in 1931, aluminum is being used not only for diffuser plate containers but also for sludge plows in the Dorr clarifier equipment, electrical conduit, pipe railings for stairways and numerous other fixtures.

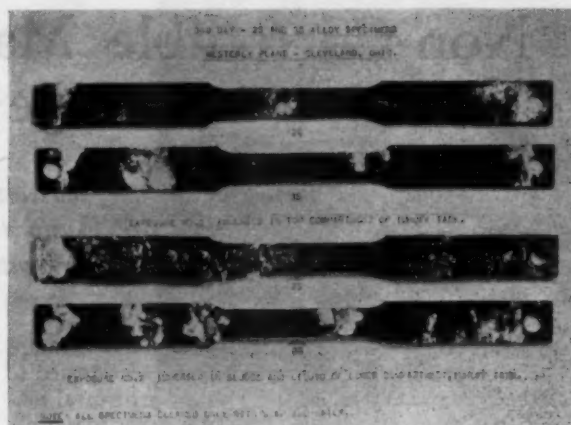


Brunotte screen, St. Petersburg, Fla. Screen bars of aluminum alloy.

In 1929, Messrs. Townsend and Brower, engineers in the Milwaukee Sewage Commission, developed a sludge removing device which is being manufactured by the Chain Belt Co. under the name of "Tow-Bro Clarifier", in which the headers and inlet nozzles were made of cast aluminum alloy and it is proposed to use the same material for the tubing to reduce the weight.

In 1929, Charles Brossman developed an all-aluminum rotary distributor for trickling filters, which is being made by the Pacific Flush Tank Co.

In the tests of aluminum made by the George B. Gascoigne engineers in the Cleveland sewage plant, samples of sheet and of various alloys were immersed in the liquid and exposed to the air in various parts of this plant and of others in neighboring cities for various periods up to 360 days, ending in September, 1932, and some are still under test when this is being written. From these it appeared that "under normal conditions the most serious corrosion could be expected on specimens which were exposed in the atmosphere, at a point where the raw sewage enters the treatment plant proper." After 180 days' exposure in this position in the South-erly plant, Cleveland, which receives large volumes of waste from steel mills, oil refineries, chemical plants and others, and where, when chlorine is applied, there is considerable free chlorine gas in the atmosphere, the sewage gases themselves apparently had no effect, but when the chlorine gas was present there was a slight surface staining and indications of shallow pitting on some of the alloys, and on others oxidation of the sur-



Test bars of aluminum after 360 days immersion in Imhoff tank, Cleveland. Upper two in top compartment; lower two in bottom.

face metal, while one casting was entirely covered with corrosion salt; but even this last retained 85.7% of its original tensile strength, most of the others retaining 95% to 100%.

As stated, the above test locality was the most unfavorable one. Specimens immersed in sewage seldom showed more than surface discoloration. It was largely on the strength of these tests that the engineers decided to make rather extensive use of aluminum for the treatment plants designed by them.

California Regulates Use of Sewage on Crop Land

Under California's public health act, the disposal of sewage, sewage effluent or sludge for irrigation or fertilizing purposes is permitted only to those who hold a permit therefor issued by the State Board of Public Health, and subject to regulations adopted by that board on May 27th, 1933. Under these regulations:

Raw sewage shall not be used for irrigating growing crops.

No sludge or screenings can be used for fertilizing any growing vegetables, garden truck or low-growing fruit or berries, unless it has been kiln dried; dried on beds or aged by storage for at least 30 days; conditioned or aged to the satisfaction of the State Health Department; or digested to a point where it is practically odorless, drains readily and contains not over 50% of the total solid matter in volatile form.

Effluents of septic tanks, Imhoff tanks or other settling tanks, or partially disinfected effluents of sprinkling filters or activated sludge plants shall not be used to water any vegetables, berries, fruit, etc., which could come into contact with it, even as windfalls; nor shall sewage, effluents, sludge or screenings be permitted in ditches or pipes used for irrigating such crops. However, such effluents may be used on nursery stock, cotton, and such field crops as hay, fodder corn, cowbeets, etc., provided no milch cows are pastured on the land while it is moist with sewage.

These restrictions do not apply to well oxidized, non-putrescible and reliably disinfected or filtered effluents

which meet the following standard: In any 20 consecutive samples, from which five 10 cc portions each are examined, not over ten portions shall be positive for members of the Coli-aerogenes group, and in no single sample shall over half the 0.1 cc portions be positive for them. Disinfecting equipment must be in duplicate throughout, and installed in a room separate from that in which the disinfecting agent is kept, and warmed to prevent freezing; the sewage flow must be measured and the disinfectant applied in excess of actual need, which shall be checked by laboratory tests at least twice daily.

Cotton Pads for Curing Concrete

Tests have been made by the Bureau of Public Works, at the suggestion of the Texas State Highway Dept., of a substitute for burlap for covering freshly laid concrete paving during preliminary curing. This substitute consisted of mats made of plies of raw cotton separated by loosely woven cotton cloth, mats of from one ply to 9 plies and from one-third inch to 3 inches thick being tested.

These mats gave better results than burlap. With a one-ply mat, the rise in temperature from early morning to the hottest part of the day was only 60 per cent as great as under burlap and about one-third that of unprotected concrete. The bureau suggests that highway departments try these, to determine their effectiveness and cost, as they seem to offer an improved method of curing and protection against damage from freezing, and also a market for a very low-grade cotton—an American product which burlap is not.



SNOW must not be allowed to tie up **TRAFFIC**

Whether on city streets or non-urban highways, uninterrupted traffic has become necessary to the business and life of the country. Voters and taxpayers know that, with modern equipment and methods, highways *can* be kept open all winter, and they insist that their responsible officials keep them so. This is more important now than ever, with business feeling its way back to normality by an unaccustomed route, and to allow any preventable impediment to halt its progress for even a day would be a failure in patriotism. ¶ When snow comes, it arrives too suddenly to permit obtaining new equipment or even putting the old in condition—that should be done NOW. ¶ A few suggestions by our editors, contributing highway officials and advertisers are given in the next few pages.



International Trucks and McCormick-Deering Tractors Cut Snow Removal Costs « « « «

This photograph shows a 7½-ton International Model A-8 Truck and snow plow at work on a county highway in Cayuga County, New York. This big truck, with its efficient 6-cylinder engine, has the weight and power to buck the drifts and clear the roads under even the most severe conditions.

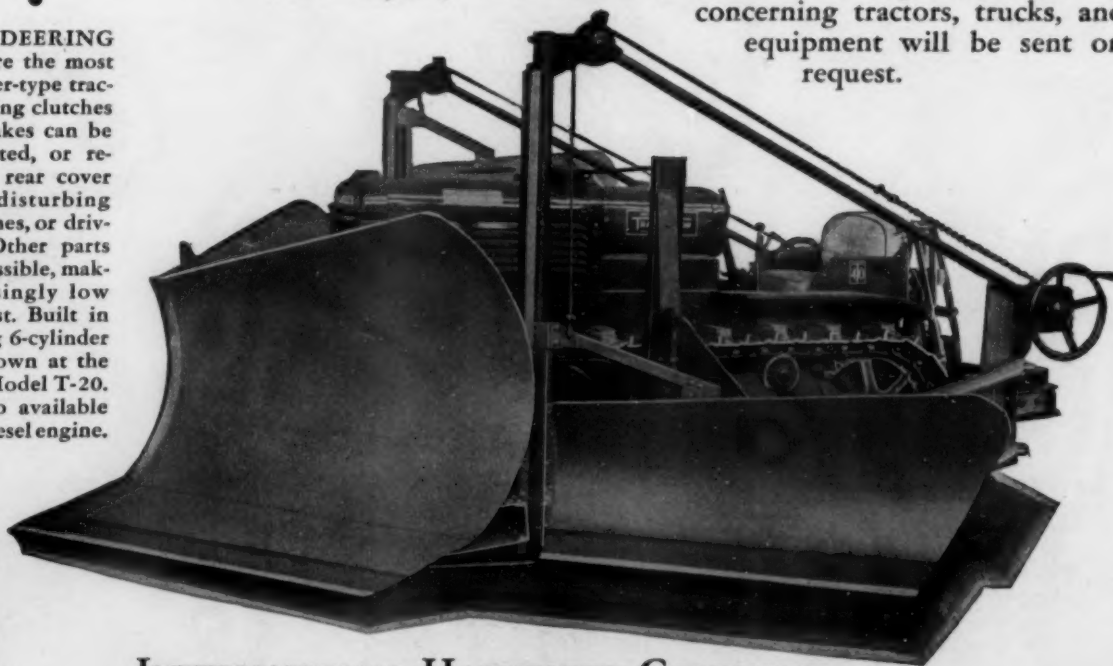


INTERNATIONAL TRUCKS are the product of International Harvester manufacturing policy, which insists on quality as the *first and foremost factor in the making of a truck*. Internationals are not the cheapest trucks to buy—but they are the most economical trucks to own and operate.

Ask an International branch or dealer to show you in detail. Sizes range from ½-ton to 7½-ton, with bodies and equipment suitable for every kind of road and municipal work. Demonstrations will be arranged on request.

McCORMICK-DEERING TracTracTors are the most accessible crawler-type tractors built. Steering clutches and steering brakes can be inspected, adjusted, or replaced through rear cover plates without disturbing tracks, track frames, or driving sprockets. Other parts are equally accessible, making for surprisingly low maintenance cost. Built in two sizes, the big 6-cylinder Model T-40 (shown at the right) and the Model T-20. The T-40 is also available powered with Diesel engine.

EVERY COMMUNITY in the snow belt is faced with the necessity of keeping the roads and streets open all winter long. Taxpayers expect economy, but they also expect convenience. Their heavy investment in highway construction and automotive equipment leads them to demand full use of the highways regardless of season or weather. Many communities are meeting this demand by plowing snow at low cost with McCormick-Deering Tractors and International Trucks. These units can be used during the construction and maintenance season for a hundred and one jobs . . . then, they can be equipped with snow plows and held in readiness for emergency work when the snow comes. Complete information concerning tractors, trucks, and equipment will be sent on request.



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Snow Removal Requires Equipment and Men

Kinds and numbers used by counties and cities throughout the snow belt.

WHAT kinds of equipment are used by counties for keeping their roads clear of snow, how many of each, and "what new equipment would be necessary for effective and economical prosecution of a thorough snow removal program," are questions which we asked county officials of all the snow-belt states. Replies were received from all these states, although a few were negative, since the counties did no snow removal; while Oregon and Washington reported that they should not be included in the snow belt, since, as one county engineer of Washington said, "It doesn't average once in five years that a depth of snow falls that requires removal"; and Yamhill Co., Oregon, "only has snow that bothers traffic about one year out of 4 or 5."

Washington Co., New York, "handles snow removal through the various towns. Each town has a beat to maintain and is paid per hour. The county has one reserve outfit for emergency." Schoharie Co., New York, rents trucks and tractors with plows from the towns. Massena Co., N. Y., uses hired equipment entirely.

Truck plows are the most popular equipment in every state but one, Nebraska seeming to prefer tractor plows. Combining figures from all the states, we find that, of all equipment in use, truck plows constitute fifty percent—sixty percent in the East North Central States. Their popularity is still further indicated by the fact that, of all new equipment reported as necessary for thorough snow removal, these constituted 60 percent.

Tractor plows are second in popularity, being 25 percent of the total. They seem to be especially preferred in the states along the Canadian border. Among the proposed new equipment they also hold second place, constituting 21 percent of the total.

Only about a third of the replies gave the size of the tractors used, but of these, 60 percent used 60 hp., 15 percent used 30's, 9 per cent used 20's, and the others were various sizes up to 130 hp.

V plows seem to be most popular in the counties, 4.6 times as many of these being reported as of straight blade plows. But the cities report using only one-third as many V plows as blade.

Maintainers and graders are used by many counties, presumably for light snow. In Iowa 23 percent of the



Fourth cut through a 20-foot drift on a mountain road, using hydraulically controlled plow.

equipment reported were maintainers or graders. The total for all the states was 12 percent; but no counties included them in the new equipment proposed.

Rotary plows are apparently increasing in popularity though still not abundant. Five percent of the counties reported using them and 3.5 percent included them in the desired new equipment.

Hydraulic plows were reported by 9 percent of the counties, while 6.5 percent included them among desired equipment.

According to our informants, only 4 percent of their snow equipment had "depreciated beyond the state of efficient operation"; and as they proposed new equipment totaling 19 percent as much as that now on hand,

(Continued on page 28)



Wing plow on a country road

Snow Removal Methods in the Village of South Orange

By Ira T. Redfern
Village Engineer, South Orange, N. J.

Many articles have been written describing methods of snow fighting employed by large cities, but few telling how small communities handle the problem. The following article, telling how it is done by a New Jersey village, will help to "fill this long-felt want."

In sending this article at our request, Mr. Redfern says: "If it ever does any other municipality any good, we will put it down here as our 'daily good turn'." We wish more municipal engineers were such good scouts.

THE Village of South Orange, New Jersey, comprises 1,827 acres or 2.857 square miles. It has an estimated population of 14,000, and within its boundaries there are 42.02 miles of improved streets including 4.47 miles of county roads. There are 18.13 miles of permanently paved streets and the balance are paved with bituminous macadam.

There is a centrally located service building two stories high and covering a ground area of 50x105 feet which houses the Streets and Sewer Departments, part of the Park Department and a part of the Water Distribution Department. A clerk is on duty in the office of this building continually during working hours and for twenty-four hours if necessary during storm periods.

For the purpose of snow removal, the village has been divided into eight districts and maps are prepared of these districts, pasted on cardboard and lacquered for waterproofing purposes and two copies are filed in the Service Building and one in the Engineer's Office.

The snow removal equipment consists of nine snow plows (Goods Roads Machinery Co. and Baker Co. Truck Plows) and approximately 120 snow shovels. Eight of the plows are assigned, one to each of the districts, and the ninth is held as a stand-by.

Each year, sometimes in the month of July but usually during the month of August, plans and equipment are checked over, revised and repaired if necessary, and are ready for action, never later than September 15th; and since it is necessary to employ trucks of local contractors, allocation of plows on agreements as to compensation are made with these contractors on or before September 15th.

Sometime during the month of October and never later than November 1st, plow blade equipment is attached to trucks to which plows have been allocated, leaving the plow blades themselves off for attachment immediately on notice from the Street Superintendent, Chairman of the Street Committee or the Engineer; and each of these trucks is furnished with a copy of the plan above referred to, which is usually posted in the cab of the truck.

Depending somewhat on the weather forecast, (which is posted daily all the year round in the office of the Service Building,) snow removal work begins when two and one-half inches of snow has fallen, and continues until the job is finished.

From five to fifteen trucks are hired for removing the snow from the streets. These are engaged to include a driver, and the Street Department of the Village furnishes one man with each truck for a helper. Experience has taught that this is necessary. Payment for truck



SNOW REMOVING DISTRICT NO. 11, SOUTH ORANGE
A map of each section, about 10" x 12", is pasted on heavy cardboard and lacquered all over, front and back, so as to be waterproof, and is kept in the cab of the snow-plow truck assigned to that district.

services is made on an hourly basis and is usually adjusted and agreed upon each year.

The work is directly in charge of the superintendent who, with two assistants, direct and constantly check on the work as it progresses. The extra plow used to help out in any of the eight districts where traffic is heaviest or in a district where a plow has had a breakdown or for some other reason is temporarily stopped. This latter seldom happens.

As the plows are operating, groups of men with snow shovels follow the progress of the plows and clear street intersections and crosswalks as it becomes necessary to keep traffic moving. These groups operate first on the more heavily travelled streets, including business centers, public buildings and churches. Snow is never actually removed excepting from business sections and adjoining public buildings and churches.

In the actual removal of snow, it is shovelled into trucks by hand and dumped on vacant property privately owned and previously arranged for or on public parks.

Our objective is to keep traffic moving over all public streets and to provide reasonable access to business and public buildings during snowstorms, and with the foregoing arrangements we have been more than reasonably successful for a good many years and at a reasonable cost.

We have never had any difficulty in getting a sufficient number of men. From 20 to 200 are used, as may be determined by the necessity of each storm.

We do not know the life of a plow; we have some ten years old and still in good condition.

Successfully operated trucks with plows attached must be loaded with at least a three-ton load and in most instances they must be provided with skid chains.

(Continued on page 28)



NEW

EASE AND SPEED OF OPERATION

Rolling instead of shoving snow means less power for the same result. Getting the bit under is the first step. Next, the pronounced curvature of the blade carries snow up and over on itself—and because of the widening out of the blade to the right, a screw motion is developed rolling snow to the side of the road—without blowing back into the radiator or windshield.

To advance the bit, as this new design does, in an almost horizontal position, required a new tripping mechanism to avoid damage in striking solid obstructions. This is provided by a toggle support which "breaks" when struck by a heavy sharp blow.

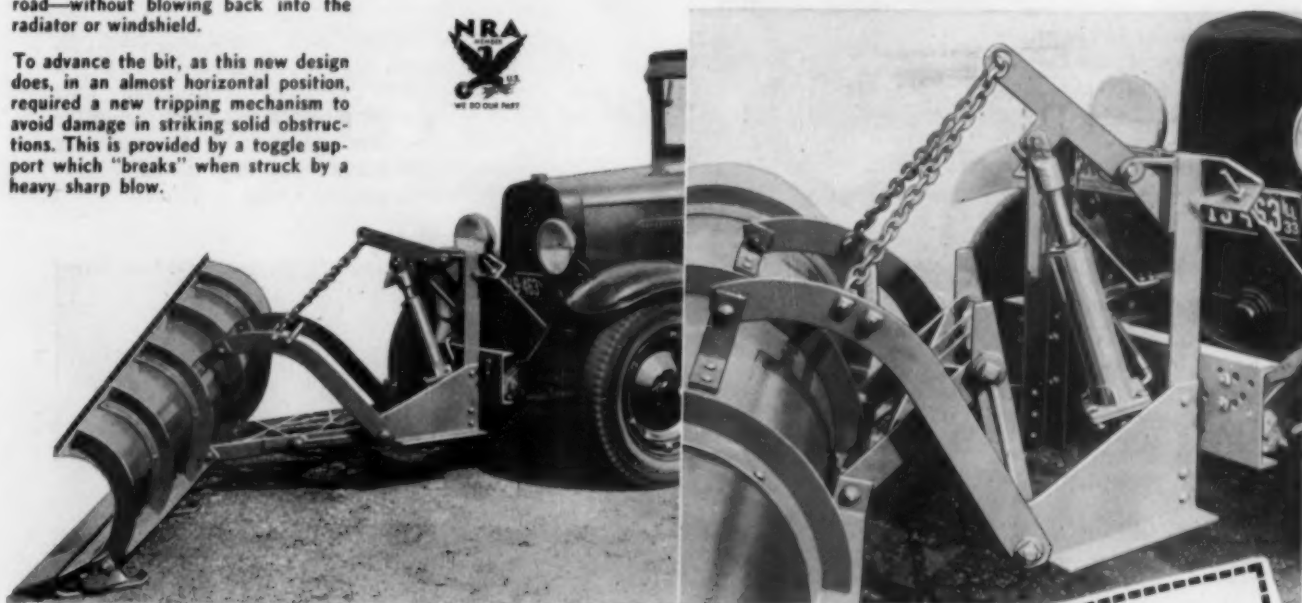
Before snow flies you will want to know and understand this improvement which will this winter save so much time and money—and prove so much easier on your equipment. Send for full details on the Western Series 1½ Snow Plows. All are made for quick attachment to trucks of 1½ ton or greater capacity, except those specially adapted to the Cletrac "35" Tractors. Hydraulic lift is available on several types, eliminating operating arms over the engine hood. Efficient 6' and 8' blades for simple application on Cletrac "20" Tractors provide an effective Sidewalk Plow.

Send the coupon for the new and interesting details on the Western complete line of Snow Plows.

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Note the high point of suspension on this blade. On striking manhole covers or traffic markers the bottom of the blade swings back and rides over, by the toggle release shown at the right.

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ROAD ROLLERS, CRUSHING & SCREENING PLANTS, SCARIFIERS,
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Gentlemen: Please send details on Western Snow Plows,
including the new Series 1½.

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US DISTRIBUTORS
WAGONS, SNOW PLOWS.

Snow Removal Methods in the Village of South Orange

(Continued from page 26)

The work is unquestionably more trying on trucks with plows attached than ordinary truck work.

A detailed statement of the cost could be furnished but we feel that this is a local item which can be reasonably adjusted to fairly meet the conditions existing at a given time in any municipality which may wish to adopt the method herein described.

It was our former practice to provide a budget item for snow removal, but this was found unsatisfactory because it was never possible to anticipate requirements and there was usually a balance or a deficit. The latter was easily arranged for, but a balance indicated that the taxpayers had been asked to pay more taxes than was necessary, and when such a balance was anticipated near the end of the year it sometimes led to unnecessary expenditures. Our present practice is to provide snow removal money entirely as an emergency expenditure (which it actually is) after the work has been done.

A village ordinance requires property owners to remove snow from sidewalks and gutters within twelve hours after it has fallen. If this is neglected, the Street Department does the work and a notice of same giving day, date and hour is delivered to the property owner and a copy filed with the tax collector; and the actual cost, calculated for each storm, is charged on the tax bill.

Snow Removal Requires Equipment and Men

(Continued from page 25)

it is apparently desired to increase the number of those in service by 15 percent.

An exceptional case is an Oregon county which now has no equipment, but proposes two 4-wheel-drive trucks, 2 rotary snow plows, 2 V plows, and 4 hydraulic scraper blades.

In cities the figures naturally are different. Four percent of those reporting use mechanical loaders; about

Five to fifteen horsepower tractors are replacing horses for plowing sidewalks.



25 percent of the equipment used is trucks (in addition to the 50 percent of truck plows), used for removal of snow (of which there is little in county work). Tractor plows constitute only 8 per cent of the total, but 19 percent of the proposed new equipment, indicating increasing use. Mechanical loaders constitute 2 percent of the proposed equipment.

Few if any cities use horses for snow work, except for sidewalks. One Illinois city has 27 horse-drawn sidewalk plows, which, however, "could be replaced by about 4 small tractors for sidewalk plows."

Many more men are used for snow handling in the cities than in the country; which is fortunate, considering the difficulty of getting men to and from the job on long country roads during heavy storms. For example, Hartford, Conn., figures on using, for each storm, 400 men for two days, and 100 men for four additional days; their equipment comprising 20 motor truck snow plows and 4 mechanical snow loaders. Evanston, Ill., uses about 90 men at a time. St. Paul uses over 500 men. Of the counties, none reports over 100 men and several as low as 6 or 8, while the average is 27 men. But only three municipalities report less than 15 men, and the average of all is 58.

The character of the men is different, too. In cities, most of them are used for hand shovel work. For a typical use of men on county snow work we may take Grundy Co., Iowa; 14 patrolmen and 14 helpers on the 14 motor graders; 4 truck operators on a 4-ton truck and plow; 6 tractor operators and 6 helpers on 2 "Sixty" tractors with hydraulic plows; a total of 44 men.



Snow Loader expedites removal of snow from city street.

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Model 68 S Sno-Plows and
Model 12 F H R Leveling
Wings with full hydraulic
control attached to 5-7 ton
trucks.



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*Pushes Easier . . . Absence of Side Thrust
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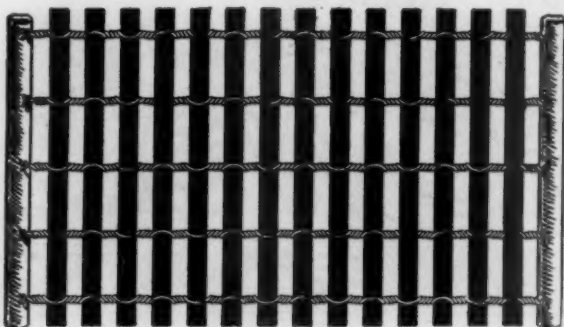
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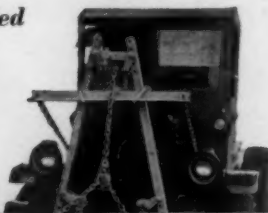
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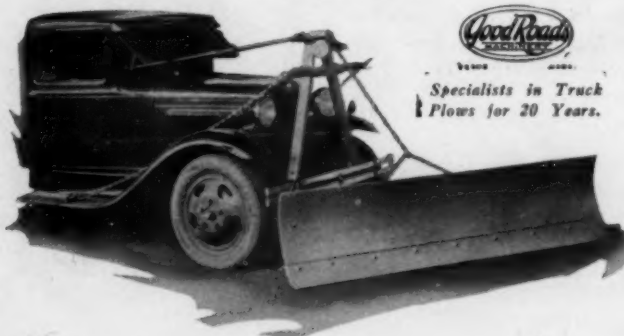
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The Public Works Wage Scale Muddle

UNDER the Industrial Recovery Act it was provided that "all contracts involving the expenditure of such grants (from the \$400,000,000 appropriated for the emergency construction of public highways) shall contain provisions establishing minimum rates of wages, to be predetermined by the State highway department." Most of the states have fixed such minimum rates and presumably have awarded contracts on that basis.

On August 17th Secretary Ickes fixed minimum rates for public works projects which differed widely from most of the rates as fixed by the State departments. On August 24th the Board of the Public Works Authority exempted highway work from the provisions of the minimum wages established for other public works, except roads in national parks and other public lands. It also seems probable that the P. W. A. rates may be required for other highway work for which contracts have not yet been let.

Even should no further changes be made, we will have the condition of men working on highways receiving wages differing considerably from (in some cases less than 50% of) those paid on other classes of public works in the immediate vicinity. This certainly may be expected to lead to dissatisfaction and labor troubles, and demands by contractors for reimbursement for higher-than-contract wages made necessary by such conditions.

This confusion is most unfortunate and it is hoped that something may be done to straighten it out.

An illustration of how this has worked out is afforded by a letting, early in September, of a contract for a sewage disposal plant by Fort Atkinson, Wisconsin.

On August 14th the Industrial Commission of Wisconsin proposed, and a group of 34 contractors adopted, a minimum wage scale for construction work, dividing the cities of the state into six groups, the wages in the highest being about 25% to 50% higher than in the lowest. The rates for the lowest class, which included Fort Atkinson, ranged from 45 cts. for common labor to 85 cts. for bricklayers, masons and plasterers.

In advertising for bids for the disposal plant, contractors were asked to submit bids based both on payment of these wages and disregarding this wage rate. Thirty-four bids were received, the lowest being \$38,300 and \$37,800 respectively, and the highest \$52,000 and \$49,000. When the bids were opened, however, the engineer for the work, Robert Cramer, recommended that the bids not based upon the proposed wage scale be disregarded "because conditions have developed since the specifications were written which would make it impossible for any contractor to construct the plant without complying with the provisions of the Recovery Act." Accordingly the contract was awarded to the lowest bidder at his higher bid.

But the situation was again complicated by the fact that, after that, the Federal Emergency Administration established minimum rates for the Northern Zone (which includes Wisconsin) of 50 cts. for unskilled labor and \$1.20 for skilled labor. Public officials and contractors have appealed to the F. E. A. for permission to use the Industrial Commission's wage scale instead.

Meantime, the contractor has begun work under an agreement whereby he is to pay the wage scale finally proclaimed by the F. E. A., if the city so order, and the city is to reimburse him for the excess wage payments, plus insurance and overhead. This presumably would add, roughly estimated, about 25 per cent to the cost of the plant, or say about \$10,000.

The city is especially influenced to arrange for the payment of F. E. A. wages because it has applied for (and was reported Sept. 16th to have been allowed) a grant of \$18,315, which is 30% of the total cost of the plant. (It did not ask for a loan from the F. E. A.)

The wages fixed by the several States and those announced by the P. W. A., as reported, are given in the accompanying tabulation:

Southern Zone	Unskilled Labor		Skilled Labor	
	State	PWA	State	PWA
S. Carolina	\$0.30		\$0.40	
Georgia	.30		.40	
Florida	.30		.40	
Arkansas				
Alabama	.30		.40	
Mississippi	.30	\$0.40	.40	
Louisiana	.30		.50	
Arizona	.50		.625 & 1.25	
Oklahoma	.40		.60	
Texas	.35		.45	
New Mexico	.50		.65	
Average(.514)			

Central Zone	Unskilled Labor		Skilled Labor	
	State	PWA	State	PWA
Delaware	.30 & .35		.40 & .45	
Maryland	.30 & .35		.375 to .525	
Virginia				
Tennessee	.30		.40	
Colorado	.60		.75	
Utah	.50		.60 to 1.125	
California	.60	.45	.75 to 1.375	
N. Carolina	.30		.40	
W. Virginia	.35		.45	
Kentucky				
Missouri	.40 & .50		.75	
Kansas				
Nevada	.60		.75	
Average(.629)			

Northern Zone	Unskilled Labor		Skilled Labor	
	State	PWA	State	PWA
Maine	.40		.45	
New Hampshire				
Vermont	.333		.40 to .80	
Massachusetts	.45		.55	
Rhode Island				
Connecticut				
New York	.40 & .50		.55 to .75	
New Jersey				
Indiana				
Wisconsin	.45 to .60		.55 to .70	
Minnesota	.55		.65	
Nebraska	.40	.50	.60	
Wyoming	.55		.65	
Oregon	.55		.65	
S. Dakota	.45		.55	
Idaho	.55		.65	
Pennsylvania	.35 & .40		.45 to .75	
Ohio	.40 to .60		.60 to .90	
Michigan				
Illinois	.40		.50	
Iowa	.40		.60	
N. Dakota	.50		.60	
Montana	.60		.75	
Washington	.55		.65	
Average(.615)			

Unemployment Relief Road Work In Onondaga County

ONONDAGA COUNTY, New York, has been finding work for hundreds of its unemployed in improving 285 miles of roads with low-cost construction. This is furnishing useful work for six thousand men who would otherwise be dependent upon welfare and relief organizations, paying them about ten dollars a month per man over and above the cost of having them on the welfare list. Farmers' teams are hired for the hauling, and local materials are used for surfacing, only five percent of the total expenditure going for materials obtained from elsewhere.

The men used are of all classes, farmers, "white-collar" men, young and old. One foreman is a man of fifty, formerly appraiser for a local bank. One of the laborers was formerly leader of a jazz orchestra. Most of the men show a real will to work, using picks and shovels instead of machinery to make the cuts and fills and prepare the grades for surfacing.

The Board of Supervisors of Onondaga County at the beginning of the 1932 fiscal year, informed the county superintendent of highways, R. B. Traver, that the highway funds would be greatly reduced but the employment must be tripled, which would necessitate spending not more than 10 percent of the funds for materials. How he planned to accomplish this was described by Mr. Traver before the Association of Highway Officials of the North Atlantic States last



Traffic marker on gravel treated with calcium chloride. Button Road, Onondaga County

spring and in *Public Works* for April. As he stated in this paper, the plan adopted was as follows:

"(1) New construction work for the next few years to be confined wholly or mainly to preparation of county roads for pavements to be laid when and if traffic and budgets would warrant.

"(2) Grading and aligning the roads as though they were to be paved with the higher types.

"(3) Installation of the drainage systems and structures, guard rails, etc. with the same thought in mind.

"(4) Surfacing of roads for immediate use with bank run of gravel spread to a width of 20 ft., 9 in. thick at the center and feathering to 5 in. at the edges.

"(5) Treatment of the surface with a cheap binder or dust preventative.

"(6) Maintenance of these gravel roads.

"(7) Employment to be provided for approximately 1000 men, this being about three times the number usually used during the construction period."

About fifty miles of road were built along this plan last year. Local gravel was used, with sand, clay or loam mixed with it by means of a grader, the material

being taken from the shoulders of the road. For surface treatment, calcium chloride was selected as the best and cheapest material. The resulting roads were even better than anticipated, the calcium chloride acting as a binder as well as a dust layer. The surface is impervious and needs very little maintenance, even on grades as high as 10%. The cost of all materials, including gravel and calcium chloride, was within \$500 a mile.

With this proof of the success of the plan, the Board of Supervisors authorized applying it to fifty more miles in 1933, with the hearty approval of the taxpayers. The construction method employed is as follows:

The roadway surfaces are properly surveyed for alignment and grade and all culverts installed. After the subgrade has been brought to surface, gravel



Road work for the unemployed in Onondaga County. This must carry old-time engineers back forty or fifty years.

is spread to a width of 20 ft., 9 in. deep in the middle and 5 inches at the sides, and sand and clay mixed with it to obtain the desired proportions. After surfacing, calcium chloride is applied at the rate of $1\frac{1}{2}$ lbs. to the square yard. Traffic quickly consolidates the surface to a smooth, hard, dustless highway. It requires no blading except after heavy rains. It is found practicable to paint traffic lines on the surface—although this has usually been thought possible on concrete and asphalt only.

Low-Cost Oil Surface Road

(Continued from page 20)

safe driving speed. As before mentioned, these curves were widened to the maximum afforded by existing roadway, it being deemed that this widening was more beneficial than super-elevation.

In order to reduce erosion on the hillside, 16 catch basins were installed on Yarnell Hill; gutter approaches made of asphaltic material, with one-half inch maximum for aggregate, lead into the catch basins for lengths determined in the field, to relieve possible scour along the shoulder line. Catch basins and gutters are functioning satisfactorily.

Since completion of the contract, the highway has been striped. On curves, the marker is placed so that the minimum distance is on the inside; that is, if the curve is 20' 6" wide, a distance of 9' 6" was measured from the inside, leaving the outside lane 11 feet; this for the reason it is much harder for the driver to hold to the outside.

The striping of the highway at a relatively small cost has increased the driving safety many fold. All that is required on the mountain grade is for a person to stay on his or her own side.

The Goat

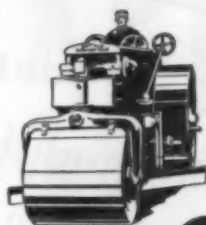
"The older I grow, the animal that I have come to admire the most, I believe, is the goat. Nobody ever saw a goat with his tail between his legs. He turns up his front end to the world and fights."—Ray Lyman Wilbur.

Yellow Background Best for Highway Signs

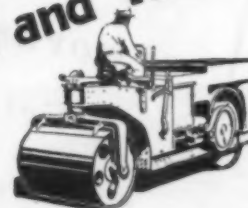
A joint committee of eight members of the National Conference on Street and Highway Safety and seven of the American Association of State Highway Officials was formed in 1931 to formulate a joint code on highway signs; and at its request the Bureau of Public Roads and Bureau of Standards carried on a thorough investigation of color combinations and reflector buttons for signs. These included both summer and winter conditions, by day and night, in lighted city streets and dark country roads, during sunlight, rain, snow and fog. In the test 121 observers were used, men and women, possessing a wide range of intelligence and of education.

The findings in this investigation of standard luminous and nonluminous highway signs are briefly summarized as follows:

1. *Daylight observations on nonluminous signs.*—All evidence points to the definite conclusion that the standard yellow background with black letters or design,



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WILLIAM MADLUNG, Mng. Dir.

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In undertaking your share of this great construction plan, and also in the completion of other projects that you have under way or in prospect, you want to use the most effective and reliable materials. Unless they are carefully selected and efficiently used, the anticipated results will not be achieved.

Through the 130 years during which the du Pont Company has been manufacturing explosives, it has steadily been improving its products and developing new types for definite purposes. With modern plants situated in strategic areas, ample production is assured. Its nationwide distribution system ensures promptness in the execution of orders for du Pont explosives.

The extensive variety of explosives available for various uses makes it important to exercise care in their selection. Assurance of obtaining the **RIGHT** products will be found in restricting selections to du Pont explosives, which have earned world-wide recognition for superiority.

Our explosive engineers are observing and reporting the performances of du Pont explosives on a great many projects throughout the country. These findings are available to all engineers, contractors, and others engaged in the Government's construction program, or in any project in which the uses of explosives are essential.

Inquiries relating to selection and use of explosives should be addressed to any of our Branch Offices, or to

E. I. DU PONT DE NEMOURS & CO., INC.

Explosives Department

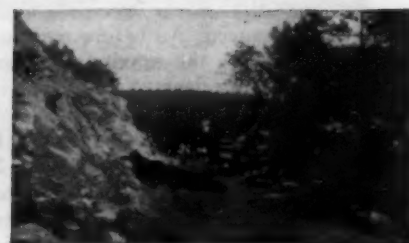
WILMINGTON, DELAWARE

BRANCH OFFICES

Birmingham	Chicago	Denver	Duluth
Huntington	Joplin	New York	
Pittsburgh	Scranton	Seattle	



There is a



THOROUGH CUTS

WHEN a cut is to be made through a hill leaving a bank or wall on either side, use Du Pont Quarry Gelatin, Red Cross Extra, Red Cross Blasting Free-Running Powders or R. R. P. The explosive to select depends upon the nature of the rock and the working conditions.

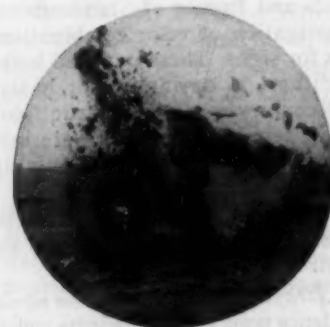
Quarry Gelatin is made especially for wet outside work. Use the higher strengths for hard rock, and the lower ones for soft or easier-breaking rocks.

If the holes are not particularly moist, Red Cross Extra will give good results. For deep holes in fairly dry work, the Free-Running Red Cross Blasting Powders are very economical.

BOULDERS

FOR mudcapping, remove the dynamite from the shell, pack it in a conical heap on the boulder; insert cap and fuse, cover explosive with several inches of thick, heavy mud. Never lay stones on top of mudcap. For snake-holing, punch hole beneath boulder and in such a location as to ensure charge being placed against boulder. Tamp charge compactly.

Red Cross Extra 20% or 40%, Du Pont Extra D, or Agritol are effective for snake-holing where there is heavy soil under boulders to provide the required resistance.



DU PONT EXPLOSIVE

made especially for every type of work!



SIDE HILL CUTS

IF in hard rock, use Quarry Gelatins. Softer materials may be successfully handled by Red Cross Extra grades, or in dry work Free-Running Red Cross Blasting or granular black powder may be used.

In working from the side, slight variations are made, depending on whether excavated material is to be used for filling or is wasted down the hill. If it is to be used for filling, the loading should be barely heavy enough to break the ground for convenient handling. In working from the end, the rules for thorough cuts apply, and the same explosives are recommended.

STUMPS

STUMPS in firm soil are more easily blasted than when located in sandy soils. For blasting green, lateral rooted stumps, use 40% Red Cross. For tap-rooted stumps, use Agritol, or, if soil is heavy, Red Cross Extra 20%; if light soil, use Red Cross Extra 40%. To blast tap-rooted stumps out of light soil, use Red Cross Extra 40%.

For blasting the big stumps in the Pacific Northwestern States, use Du Pont Loggers' Powder.



QUARRYING

IF stone is to be crushed for road building, use Red Cross 40%, Du Pont Extra, Gelatin, or Gelex. Holes should be well tamped and charges fired simultaneously.

For quarrying dimension stone, use blasting powder of fine granulation to start cracks and seams in the desired direction. For extremely hard rock of the granite or trap types, Du Pont Quarry Gelatin should be used.

GRAVEL PITS

BLASTING is effective for speeding up excavation to obtain grading material. Bore holes are spaced about as for other blasting. If rock is not encountered, holes are loaded much lighter—the object being to loosen the material sufficiently to make digging easy. Use Red Cross Extra 20% and Red Cross Blasting No. 2 F. R. for this work.



FILL SETTLEMENT

DYNAMITE can be effectively employed for removing muck and other unstable material from roadbeds. Dynamite is exploded to create cavities for the fill to drop into, and also to stir up and liquefy the mud surrounding the cavity to permit the rapid settlement of the fill.

Du Pont Ditching Dynamite is particularly effective, because of its water-resisting and propagating qualities.

If necessary to place the explosive under the fill, use Du Pont 40% Gelatin in large-size cartridges.

DITCHING

DITCHES can be blasted in wet soil by the propagation method; or the electric method can be used in wet or dry soil.

In wet soil, the propagation method, when used with Du Pont Ditching Dynamite, simplifies drainage construction and effects economies in time, labor and money. Ditching with dynamite is frequently successful where conditions make other methods impractical.



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under all conditions reasonably to be expected in either urban or rural driving, is much superior to black on white or white on black. In addition to the greater readability of the legend the yellow background has a greater signal value, being more arresting to the average observer and more conspicuous by contrast with the average natural or artificial background. By the adoption of a definite shade and hue it should be possible to prohibit the use of this distinctive shade for any roadside advertisements or signs other than official highway signs.

2. *Night observations on nonluminous signs.*—While these observations were not in any way conclusive, the inadequacy of daylight signs for night driving was clearly indicated. The effect of a snow background was especially noted.

3. *Night observations on luminous signs.*—Observations were made with three sizes of reflector button, 0.95-inch, 0.76-inch, and 0.58-inch, under conditions simulating both rural and city driving. The conclusion was reached that the colorless button with a diameter of 0.76-inch and a minimum spacing between buttons of 1 inch, center to center, is, in general, the most efficient. For rural use the 0.58-inch button has a superior long-range signal value, but is less readable than the unit of larger diameter.

4. *Daylight observations on luminous signs.*—The effect on distinctness in daylight of inserting reflecting buttons in the letters is not serious at a distance of 200 feet, even though approximately 50 per cent of the area of the letter is taken up by colorless buttons. The difference in the effect on black and on white letters is negligible.

5. *Recognition by shape of sign.*—The practice of outlining highway signs with reflector buttons, so that the road user may recognize a potential hazard at a distance by the distinctive shape of the sign plaque alone, is worthy of further development. The use of symbols, except for the arrows indicating curve or direction, is not considered as effective as outlining the sign with buttons.

Sound Unemployment Relief Work at Port Jervis

(Continued from page 15)

off the fills. It is thought that the cost of handling by this method was reasonable, though more, of course, than to handle by power shovel. All tools for the work were bought and provided by the city.

The rock cut is 2768.5 feet or 0.52 mile in length. The maximum cut was 50 feet on the upper slope and 25 feet on the lower side. In rock, the side slopes were 4 on 1. The pavement will be of concrete, 30 feet wide, laid in three 10-foot lanes, with slabs 50 feet long, but provision has been made for a fourth lane if ever required. The road is several hundred feet above the Delaware valley and affords a very spectacular view of the city, and a large section of Pennsylvania and New Jersey. The design and engineering features were under the direction of F. X. Conrad, City Engineer.

Results of the Work

The results of the work, which was initiated and successfully carried out through the energy and ability of Wendell E. Phillips, the Mayor of Port Jervis, can well be summed up by the statement of the Chairman of relief activities: "With 30% of the families in need, at least 50% of the stores and business places in the city would have been closed if it had not been for this work."

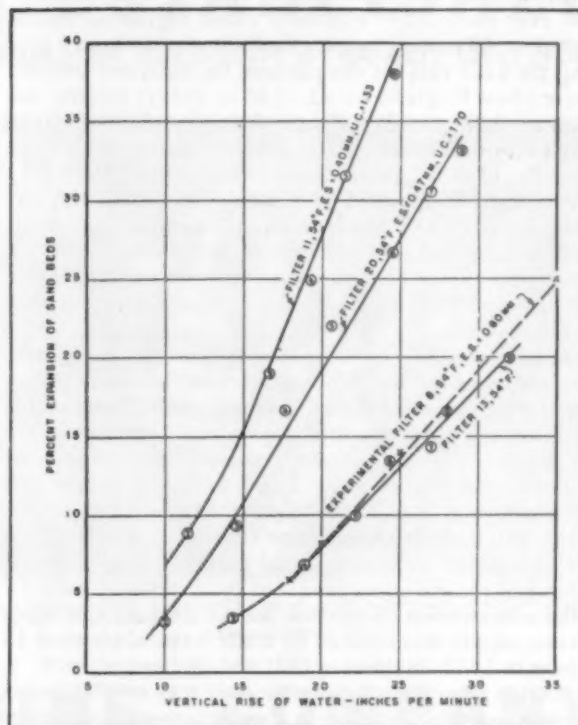
THE WATER WHEEL

FOLLOWING are the essential features of the important articles of the month having to do with water works design, construction and operation and water purification, arranged in easy reference form and condensed and interpreted. Published every month to include articles appearing during the preceding month.

SLOW sand filters are preferred to rapid sand by the borough engineer of Durban, South Africa,³⁵ because they remove algae tastes and odors and more thoroughly purify the water without "a sequence of chemical reactions" which mean unending trouble. "It would appear from a survey of world experience that the proper place (for rapid sand filters) in future will be as primary or roughing filters preceding slow sand filtration or some other refining process," as is now practiced in treating a highly contaminated water for London's water supply.

Filter sand was reduced from an average size of 0.30 mm., with a uniformity coefficient of 1.25 to 1.4, to an effective size of 0.38 mm. by washing in the Washington, D. C., rapid sand filters.¹⁹ Beds built in 1927 were designed for sand of 0.45 mm. effective size, but as 29 acres of abandoned slow filters contained abundant sand of 0.30 mm. and could be placed for about \$1.00 a ton, this was used, placed 24 inches deep, with the idea of washing out at least 6 inches of it as quickly as possible. They were repeatedly washed at as high a rate as possible and then 5 or 6 inches scraped off; which left sand of about 0.35 mm. size. Although washed at 18.5 in. vertical rise per minute, mud balls, dead areas and deep cracks formed which no washing or prodding relieved, so the entire sand was put through a sand washer and returned hydraulically. Beginning 1930 the washing rate was increased to a 27 in. vertical rise maintained for two minutes, but hard spots again began to form. Agitation by air and water jets of various designs were ineffective. "Finally a 2-inch fire hose was used, playing a sharp stream from a 3/4 in. nozzle at 50 lb. pressure, on the drained filter over the sand surface, being careful not to hold it too long in one spot. Since then a man has gone over 2 or 3 beds daily prior to the regular wash, taking about 2 1/2 hours per bed. While this has not entirely prevented hard spots it has kept the beds in a very satisfactory condition. Successive layers of fine top sand have been scraped off until the filters average 16 in. depth and 0.38 mm. effective size."

Even this is considered too fine and experiments were begun in the summer of 1932 to determine the optimum size. Anything over 0.6 mm. was found to be too fine for Washington water, and two beds were covered with 0.6 mm. sand. Only 20% maximum expansion was obtainable with a 32 in. vertical rise, water 39° F. and dropped as the temperature increased; the drop being about 50% with a rise from 39° to 72°. A definite expansion is optimum for each sand size; 30% is adopted



Expansions of different sized sands at the same temperature.

at Washington for the 0.38 to 0.40 mm. size. Triple "boost" washing seems most satisfactory.

Choice of sand size should be determined by the type of water and ease of coagulation, the maximum rate of filtration, and the available head for washing. About 0.45 mm. seems best for Washington, where the wash-water head is 52 ft. With higher head, coarser sand could be used. Hagerstown, Md., keeps filters in good condition using 24 in. rise on 0.45 mm. sand and securing about 50% sand expansion. (James W. Armstrong prefers rise of water to sand expansion as an expression of rate for washing filters.)

A number of cities are cooperating in a study of best size and depth of filter sand, using ten sizes ranging from 0.33 mm. to 3.02 mm., from 3 to 10 sizes being used in successive layers in a bed. So far these indicate that, with some waters, floc passes sand of more than 0.6 mm., but with most of them sand up to 1.0 mm. could be used under ideal conditions. Most cities probably would find 0.60 to 0.80 mm. most generally satisfactory. There is apparently little to be gained by increasing wash water rise beyond 36 in. per minute.

The worst water in the country used for domestic consumption is said to be that of the Colorado river, purified for use by Boulder City, Nev.²⁵ Turbidity of 150,000 ppm was reached last September as a maximum, falling to 800 in November. The average for 8 months was 1,930 ppm, reduced to 130 by a presedimentation clarifier (Dorr traction type). This water is pumped to a softening and filtering plant, and a total hardness varying from 904 ppm to 100 ppm is reduced to 120 ppm and even as low as 53. For precipitating carbonates in the secondary sedimentation basin, the method used since last October is to recirculate the sludge from the primary sedimentation basin to the primary agitators, giving superior flocculation and a "saving of 96%, or 139 lb. of hydrated lime, and 97%, or 390 lb. of soda ash per m.g. of water treated."

Typhoid death rates of 78 cities studied by the American Medical Ass'n showed the rate for 1932 the lowest ever recorded.⁵⁵ Fourteen cities registered entire freedom. Classified by geographical divisions, and giving the 1925 rate for comparison, the rates per 100,000 were: New England—0.72 (2.48 in 1925); Middle Atlantic—0.97 (2.97); South Atlantic—2.23 (7.01); East North Central—0.70 (2.32); East South Central—6.2 (13.00); West North Central—1.03 (3.43); West South Central—5.20 (13.08); Mountain and Pacific—0.87 (2.33). Memphis had the highest rate—11.4. South Bend had no deaths for three consecutive years; and Fall River, Lynn, Somerville, Waterbury, Des Moines and Long Beach had no typhoid deaths in either 1932 or 1931.

Tastes and odors are the main effect of trade wastes on quality of water.^{13, 14} They increase the cost of plants producing odorless water, and also their demand for chlorine may absorb that applied for sterilizing the water before this has been accomplished. "When the odor threshold goes above 1,000, it may cost over \$50 per million gallons more than the usual amount to produce palatable drinking water in a filtration plant. . . . No treatment except activated carbon has been found that will remove odors produced by oil refinery wastes." The effectiveness of chlorination in treating Chicago's water supply was reduced by trade waste absorption 15 times in 1932, 20 times in 1931 and 34 times in 1929.

Aside from phenol odors, the only way to tell if odor-producing substances are in a water is to smell it. Diluting with odor-free water until the odor can just be detected (the "odor threshold point") is the standard method of testing (the procedure has been standardized). This dilution ranges ordinarily from 500 parts (for sewage) to 1,000 million.

Reservoir overflow is affected by the amount of storage in the reservoir,³³ "and it has been decided that where the water area of a reservoir is 2 per cent or upwards of the catchment area, the storage provided by the rise in the water level above the weir has an appreciable effect in reducing the head of overflow." To provide against "catastrophic floods" (occasioned by extraordinary rainfalls or cloudbursts), the Floods Committee of the Institution of Civil Engineers believes it advisable "to provide overflow weirs of such lengths that floods of maximum intensity could be disposed of without the water level in the reservoir rising more than 3 ft. above overflow sill level. The minimum margin between the height to which the water would rise during a normal maximum flood and the top of an earth embankment at its lowest point should be two feet, but should be greater if there is no wave wall or if the fetch exceeds one mile."

The flood runoff into the Castlewood dam reservoir just prior to its failure on August 3rd is calculated by John E. Field²⁶ to have exceeded 146 sec. ft. per square mile at the crest of the flood. Reports indicate that the water level in the reservoir rose 11 feet in an hour, the reservoir having an area of about 200 acres and the drainage area being about 165 sq. mi. or 500 times that of the reservoir. Estimates of flow in the streams feeding the reservoir gave 333 sec. ft. per square mile from a 30 square mile area, and 267 from another 15 square mile area.

Reservoir embankments in which the soil, during construction, was "compacted at too low moisture content, regardless of the care used in construction and of how hard they are at that time, may have a capacity for

considerable more water in the voids, which causes them to become much softer when saturation occurs. The use of too light construction equipment and too little moisture in the soil may result in a dangerous condition if the dam should become fully saturated by percolating water."²⁷ "Any soil may be used in the construction of a dam if the velocity of flow is determined and found to be too slow to erode any of the soil particles, and the compacted and consolidated dry weight limits the softening from saturation, as determined by the plasticity needle, to that at which the soil is sufficiently stable for the particular dam."

State dam control is urged by the Water Resources Commission of Maryland.¹⁷ "Legislation on this matter has been in force in the States of Colorado, Idaho, Massachusetts, New Jersey, New York, Pennsylvania, Washington, West Virginia, Vermont and others." The following numbers of failures of dams have been recorded: Pennsylvania, 33; California, 26; Colorado, 24; New York, 25; Connecticut, 11; Massachusetts, 13; Missouri, 12; Ohio, 7; Michigan, 6; Minnesota, 6; Texas, 6; New Mexico, 5; South Carolina, 5; Arizona, 5; Utah, 5; and 4 or less in each a number of other states—a total of over 250 in the last 130 years. "Such structures, unless well designed and constructed and unless placed at proper locations and on safe foundations, prove a menace to life and property." State control of dams, for whatever purpose constructed, is highly desirable. As the St. Francis Dam failure jury said: "The construction and operation of a great dam should never be left to the sole judgment of one man, no matter how eminent."

Watershed protection by forest planting is urged by State Forester Besley of Maryland²¹ who names as advantages: Forest litter and humus hold rainfall and keep underlying soil porous; forest cover prevents soil erosion; is the easiest and cheapest form of protection; reduces evaporation from soils and from bodies of water it surrounds; may produce a valuable timber crop. Of two reservoirs of the Georgia Railway & Power Co., one covering 750 acres below large cultivated areas was completely filled with silt in ten years; another, above which is only forested area, shows little or no sign of silt after ten years. Cumberland's reservoir, fed from wooded hills, accumulated only two inches of silt in 17 years.

Baltimore has planted white, red, loblolly, shortleaf and Scotch pines, Norway spruce, and some tulip, red oak, black locust and ash. Wilmington, Del., uses red, white and loblolly pines and Norway spruce. The West Va. Pulp & Paper Co. uses Norway spruce. Cumberland, Md., finds best results from red pine. Planting of watersheds is most needed on the upper, steeper slopes and should begin there. To prevent erosion of reservoir banks by waves, bed green willow poles or small logs perpendicular to the bank with the lower ends in the water; they will send out suckers which will root in the bank. Evergreens are better than deciduous trees, except that the black locust can be used in badly gullied lands. (Details of this will be given in another issue of this magazine.)

Automatic pumping stations operated by Baltimore have been made still more automatic recently by sending to the main office by telephone complete information as to how it is operating.²² On calling up a station it automatically tells whether all the equipment is operating OK. If not, it proceeds to tell the nature of the trouble by a dot and dash code. Then it tells whether

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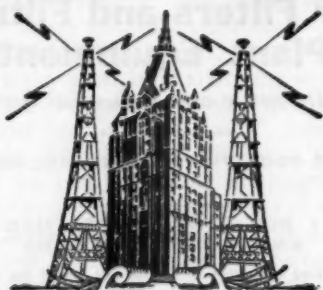
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flow is into or out of an adjacent storage reservoir, the water level in this reservoir, and the pressure in the discharge main leading from the station. Then the signals are all repeated, and the call disconnected.

The code is simple; a dot means "OK," a dash "not OK." Two dots, "unit A voltage off"; three dots, "unit B voltage off." Dash and two dots, "water into reservoir"; two dots and dash, "water out of reservoir." The station equipment consists of a compact arrangement of relays and rotary line switches similar to those used in automatic telephone exchange work, which pass battery current to a buzzer which gives the short and long sounds and a bell which rings at the end of each signal.

Aqueduct capacity was increased from 400 sec. ft. to 480 in 190 miles of aqueduct by Los Angeles.⁴³ The aqueduct comprised tunnels and conduits lined with concrete formed with both steel and wood forms, float finishes, gunite, grout and unlined rock and gravel. The friction coefficient N varied from 0.012 to 0.015, the average being 0.014. To obtain the desired increased capacity, N must average 0.012 throughout. The aqueduct could be emptied for 12 to 14 days at a time to permit the work, and this was done in a total of 66 working days in two years, using an average of 600 men. The cost was \$380,000.

A smooth plaster finish on the bottom and side walls was decided on, but the former alone secured the desired result. A plaster extremely smooth and extremely hard was finally secured by great care in mixing. Water content of sand was tested continuously and mixing water carefully measured. "It was also found that the manner of placing the mortar and its handling as regards spreading and troweling were very great factors in producing an extremely hard finished surface."

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Simple Chlorination Equipment

(Continued from page 18)

Calculations:

1 gal. water weighs 8.33 lbs.

1 part per million = 8.33 lbs., in 1,000,000 gallons (approximate). "HTH" runs about 60% available CL. .5 parts per million = 4.2 lbs. in 1,000,000 gallons. Therefore $4.2 \div .6 = 7$ or a dose of .5 P.P.M. CL. for 1,000,000 gal. would require 7 lbs. "HTH", or .007 lbs. for 1000 gal.

5 gal. water = $3,785 \times 5 = 18,925$ C.C. or, for convenience, mark the bottle at 18000 C.C.

18000 C.C. contains 1 lb. "HTH" (strong stock solution)

18 C.C. contains .001 lb.

18 C.C. $\times 7 = 126$ C.C. contains .007 lb. "HTH".

125 C.C. (close enough) in 18000 C.C. of water makes a dose of .5 P.P.M. Cl. for 1000 gal. water.

18000 C.C. $\div 1440$ min. = 12.5 C.C. per min. for 24 hrs.

Various other combinations of doses and flows may be calculated readily from the above data.

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A Digest of the Sewerage Literature of the Month

POPULATION equivalents of industrial wastes are calculated by "dividing the total daily oxygen requirement of the waste under consideration by the daily per capita oxygen demand of domestic sewage"²² taken as 0.167 lb. of oxygen calculated as 5-day B.O.D. The equivalent of paper mill wastes per ton of paper was determined in Wisconsin as 30.5, but was 1,600 for sulfite pulp and paper mills and less than 20 for ground-wood pulp and paper mills. For milk plant wastes, the equivalents per 1,000 lbs. of milk intake were determined to be 4.8 for condensery, 16.1 for cheese factory, 2.8 for receiving station and 4.7 for milk bottling plant.

At Peoria, Ill., wastes from numerous industries raised the actual population of 115,000 to an equivalent population conservatively estimated at 1,250,000.⁵

Aeration of streams is marked when the water falls over dams.²⁰ At the Marseilles (Ill.) dam during 87 months, 1926-1933, the minimum monthly pick-up of dissolved oxygen was 1.0 ppm, the maximum 4.3 and the average 2.85; greater in warm months when the oxygen was nearly exhausted above the dam. In 1932 the available dissolved oxygen in the Illinois river increased from about 50,000 lbs. per 24 hrs. at Marseilles to 250,000 at Peru, 25 miles below; the B.O.D. at the same time remaining constant although the river mean-time received the drainage of 41,000 population.

At a high temperature the oxygen content of a stream may be depleted, while in the same stream at a lower temperature the reaction may go on so slowly that reaeration can maintain substantial oxygen concentration.¹³ The growth of algae affects dissolved oxygen content. Under certain conditions of dilution the DO may indicate a very grave condition in cloudy weather but only nominal pollution in bright weather. Also samples taken at the same time from one side of a stream in shade and the opposite side in sunlight may differ greatly in oxygen content; or samples taken during daylight may show considerable oxygen concentration, while those taken at the same place during the night may show zero dissolved oxygen. This is attributed to the biological activity of the river.

Where sewage sludge lies on a river bed, it is not sufficient to consider the 20-day demand; "the six months' demand may be about 270 per cent of the 20-day demand."¹⁴

"Reduction in bacterial density by protozoa or other agency leads to increased bacterial multiplication and increased rate of oxidation."¹ Dilution by a pure stream may dilute the protozoa density and so permit higher bacterial density.

Fish life requires maintenance of at least 2.5 ppm dissolved oxygen. Before the sewage treatment plant of Decatur was operated, there was no fish life in the Sangamon river for 30 miles below the city. There is now complete treatment of dry-weather flow by Imhoff tanks, activated sludge treatment and sprinkling filters,

and the State Natural History Survey has found many more varieties and about seven times as many fish a hundred yards below the point of discharge from the sewage plant as anywhere else in the river.²³

A direct toxic effect on game fish is exercised by pulp mill waste liquors when diluted less than one part in 200 by volume, chiefly because of their oxygen demand.²² Pulp fiber does not ordinarily accumulate in and clog the gills of fish, causing death by suffocation.

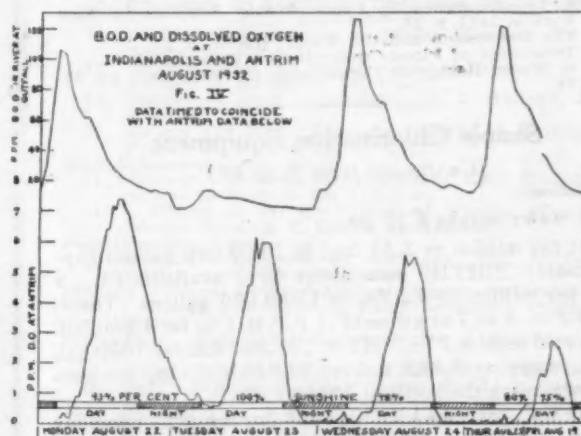
However, "there has been too great a tendency of late to overlook the possibilities of the discharge of poisonous substances."¹ In the river Tee "oxygen depletion was not a sufficient explanation of fish mortality, which was found to be due in fact to lethal doses of cyanide"; and similar toxicity is found in beet sugar wastes. "Arsenic oxide up to 7 ppm exerted no ill effects upon fish." Waste water from flax retting contain acids specifically harmful to fish.

"Very acid or very alkaline waters are known to be harmful to aquatic life."¹²

Radial outward-flow settling tanks with peripheral weirs and spiral scrapers give heavy primary sludge and a small quantity of overflow liquor, a minimum of short circuiting and good quality of effluent, in the opinion of Mr. Van Kleeck.⁶

Tank skimming should be performed periodically in both plain settling and Imhoff tanks, otherwise they will produce odors and present an unsightly appearance.⁶ Hand skimming may be avoided by installing draw-off pipes in flowing-through chambers and raising the liquid level slightly by closing the tank outlet.

Skimmings incineration is practiced at Los Angeles,¹⁰ where 4,300 lbs. per day of skimmings, 80% moisture, 78% of the dry matter volatile, is burned in an experimental incinerator 4' x 10' by 5' high, after draining on sand beds to 50% moisture. Gas fuel is used to start



B. O. D. at sewer outlet and DO in diluted effluent 6.3 miles below.

combustion. Volume is reduced more than 95%. Some odor is produced but it is not objectionable or permanent. Oil is skimmed off and burned in an open pit.

Digestion of screenings is still in an experimental stage.¹

Sludge digestion is affected by temperature, that of activated sludge much more than fresh solids.¹

Digesting screenings in the same tank as raw and activated sludge at Los Angeles gave a digested sludge, as drawn onto the bed, that "had a slimy, mushy, dull appearance and failed to give up its water readily."¹⁰

For starting a sludge digestion tank the following procedure is recommended by Mr. Van Kleeck⁶: First fill tank with fresh sewage; add fresh primary sludge mixed with milk of lime when cleaning settling tanks; circulate bottom sludge to the top several hours daily; stop liming at a pH of 7.5 or slightly under, and usually circulation of sludge also. Seeding with ripe sludge may preclude need for liming.

At Peoria the procedure is as follows: ⁵Temporary heating coils are installed in tank, which is filled with water to sufficient depth to submerge them, which water is brought to temperature of 85° to 90° and kept there. Sludge is added daily, and sufficient lime to keep the pH between 6.3 and 6.5 until natural digestion raises it above 6.5; sludge meantime being circulated from bottom to top as much as possible. After tank is half full of sludge, volatile acids are determined daily and the load reduced if they increase rapidly. The load is increased only when volatile acids are below 700 ppm and falling; if acids reach 1,500 to 2,000 ppm the tank is rested and no more sludge added until they fall below 1,000. If tank foams, it is rested and lime and circulation employed.

Excess activated sludge is preferably added to the primary tanks in Peoria⁵—gives better concentration of digested sludge and more gas.

A new method consists of withdrawing mixed sewage and excess sludge from main aeration tanks and settling in a continuously operated clarifier on a basis of 600 gal. per day per sq. ft. of surface area, withdrawing sludge from bottom once a day.

Overflow liquor from digestion tanks if returned to raw sewage should not exceed 0.1 to 0.4 per cent of raw sewage and thorough mixing is essential.⁶ Filtering through sand gives good results.¹

Overflow liquor returned to sludge re-aeration tanks at San Antonio¹ and Waco interfered with coagulation. Returning it to raw sewage at Ft. Worth gave less trouble but increased odors at the plant.

At Peoria⁵ two-stage digestion was employed, no supernatant being wasted from the first tank. Supernatant from the second tank was about 35% of the sludge pumped into the first tank, and contained 1,075 ppm suspended solids, of which 750 were volatile.

At Norwalk⁶ chlorine demand of plant effluent doubles when overflow liquor is wasted to chlorine contact chamber at rate of 1 part overflow to 17 parts sewage effluent.

Overflow liquor should not contain more than 0.2 to 0.3% total solids, or 75 to 100 ppm suspended solids.¹

Upward filtration experiments were conducted by Wilmington, Del.,¹⁹ using lead and copper wool, mixed 50-50, in a traveling screen. The results were fair, but the lead was entirely destroyed in a few weeks, no doubt by electrolytic action. Small suspended solids approaching the screen were repelled from it. Chemical precipitation and upward filtration through a copper screen

gave good results but were too expensive, and separate sludge digestion with 2 Adams revolving sprinklers requiring less than 18 in. head was adopted.

Textile waste liquors vary widely in composition and means practicable for treatment.¹² In investigations in North Carolina reduction of the color to 100 platinum-cobalt standard (about equal to weak tea) was considered satisfactory, and pH value of between 6.0 and 8.0. Conclusions from results as to the most satisfactory chemical for each kind of waste were as follows: *Indigo*—joint use of copperas and lime; second choice, alum alone. From *sulphur* dyes—strong acids, such as sulphuric, nitric or hydrochloric, the acid effluent being neutralized by mixing with alkaline waste liquors. Others obtained satisfactory results with ferric chloride in conjunction with hydrochloric acid, or copperas with sulphuric acid. *Processing* wastes—copperas in conjunction with lime. Miscellaneous *dye* wastes—copperas and lime, or ferric chloride and lime. A mixture of dye wastes requires about the same total amount of reagent as if handled individually; but a mixture with acid wastes, if available, would produce mutual precipitation and lessen the chemicals required.

Pumps, "non-clogging" or trash, clog occasionally⁸ and should have handholes on both pump volute and suction elbow, and horizontal units should have split casing.

Centrifugal pumps for sludge removal may suck through the sludge blanket, leaving much sludge in the tank⁶; excess water pumped with the sludge may chill digestion tanks and increase volume of overflow liquor. "Slow-acting plunger or diaphragm force pumps have been found very suitable for sludge pumping."

In motor controls, "magnetic contactors, especially with 'across-the-line' starting conditions, should have a carrying capacity of three or four times the full load current"⁸ and also provision be made against single phase operation by installation of "open phase" relays. In Rochester stations using vertical pumps, the intermediate shafting, bearings and couplings were arranged so the upper housing and impeller of the pump can be removed without disturbing the motor and the greater portion of the shafting below the driving unit.

Float control of pumps is most satisfactory where differential in suction well is small and close regulation desired.⁸ Air pressure control is excellent where distance between high and low water level in suction well is large and slight variation between starting and stopping points allowable.

For conduits for electrical conductors, hot-dipped galvanized conduit and conduit fittings of the gasketed type and lead-covered conductors are used.

From the maintenance standpoint, lubrication is the most important consideration.⁸ Generally grease is preferable to oil, applied by high-pressure system, and compounded to meet the conditions. Renewable bearings are very desirable.

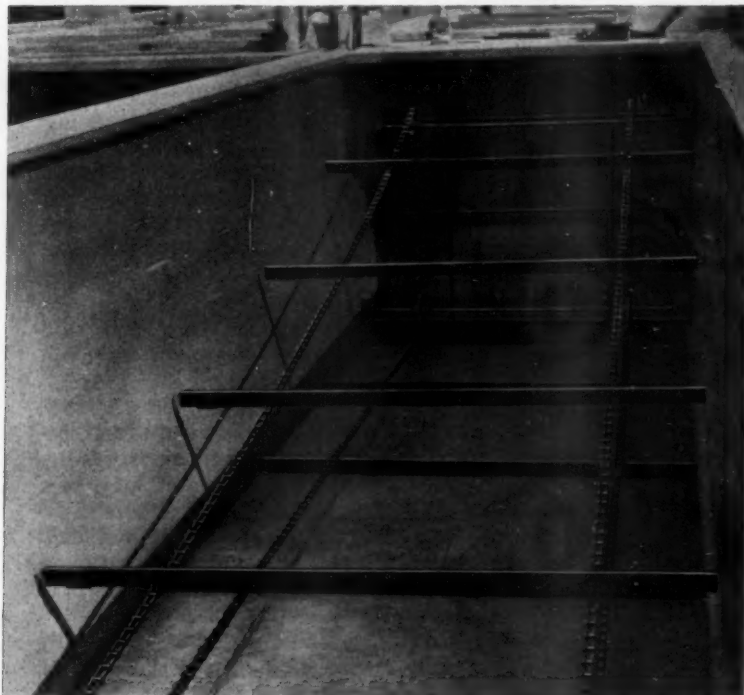
Selection of mechanical sewage equipment should be made on the basis of (1) simplification—minimum number of moving parts; (2) durability—strength and resistance to erosion and corrosion; and (3) accessibility.

Welfare labor was used by Marblehead, Mass., on 4 miles of sewer, no machinery being used except air compressors, trench pumps and concrete mixers; but otherwise the job was organized for efficiency. Young engineers, residents of the city, were used for foremen.⁹ It is estimated that the Welfare Dept. would have paid as aid to those employed between \$25,000 and \$30,000.

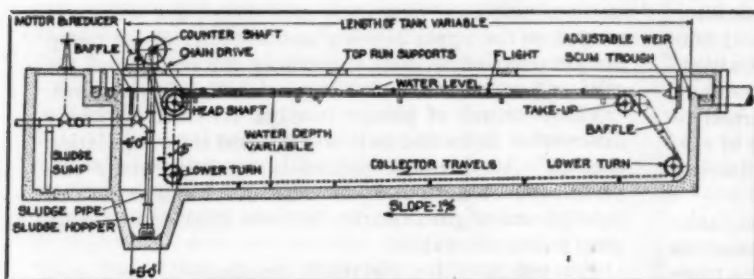
(Continued on page 47)

Short Talks with
Sewage Plant Engineers

Believe it or not!



Straightline Collector in Final Tank.



Straightline Collector as used in Primary Tank where top run serves also as a scum collector.

Only a few years ago—the accepted plan for removing sludge from a sedimentation tank was to draw or pump off the supernatant liquid, and shovel or scrape the sludge into buckets, or shove it along the bottom to an outlet pipe. The improvement of making the tank bottom as a series of hoppers, with a drawoff pipe at the bottom of each, eliminated an exceedingly nasty and tiring job. And when removing the sludge by hydrostatic pressure through pipes placed in the hoppers was introduced a few years ago, it seemed as though perfection had been reached.

But hoppers seldom clean themselves thoroughly, no matter how steep (within practicable limits) their sides may be; the tanks must be narrow, or the hoppers wide and correspondingly deep; and every foot depth of hopper adds to the cost and carries the excavation that much further into quicksand, rock or water-bearing ground. No wonder that construction costs so often far exceed the estimate!

Putrefying sludge clinging to the sides of hoppers is no longer considered permissible; it causes offensive odors and scum, and nullifies all efforts to deliver *fresh* sludge to digestion tanks.

Removal of *all* sludge, at least once a day, mechanically and *inoffensively*, is the only approved modern procedure. *Link-Belt Straightline Sludge Collectors* do this with any size of tank, and keep the surface free of scum also. Send for Book No. 642.

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The Digestion Tank

(Continued from page 43)

The total expenditure for the work was about \$102,000, of which \$62,250 was paid to Marblehead citizens for labor, or about \$30,000 more than would have been paid for aid. It is estimated that if let by contract the cost would have been \$20,000 less than it was; so the town saved \$10,000.

Of the 250 men employed, not more than 50 were of the unskilled labor type, the others being shoe-workers, clerks, seamen, carpenters, truck-drivers, etc. Work per day per man was limited to 4 hours, and it is believed that men unaccustomed to heavy work did 75% as much work in that time as they would have done in 8 hours. This also doubled the number of men employed.

Cast iron house connections, in the opinion of Mr. Devilbiss¹⁷, "with joints of leadite, minerelead, sulphur compound and lead, provide a cheaper service in first cost, at least as durable if not more so, than can be secured with any of the other types of pipe commonly used for this purpose, and most certainly a service lower in maintenance cost." In 1932, 60% of the connections laid by the Washington Suburban Sanitary District were of 4 in. cast iron pipe. The 12 ft. to 18 ft. lengths of this, reducing the number of joints, reduce cost of laying and joint trouble. After three years' use of c.i., not a cent has been spent in maintaining them, and no tree roots have entered them. Thirty months after a connection had been made with 6 in. terra cotta, deep and wide socket, jointed with an asphalt compound, it was completely clogged with tree roots that had penetrated directly through the compound. Walter C. Munroe believed it "impossible to lay terra cotta pipe with cement joints and secure a consistently root-proof pipe line." Mr. Ruark reported as root-proof, joints made of red puddle clay into which coarse salt has been kneaded, packed into the bell and covered with a thin layer of rich cement mortar. Robert B. Morse said the advantages of c.i. house connections is obvious, except for the cost; but he finds the cost of connections using 12 ft. to 18 ft. lengths of 4 in. c.i. pipe to be slightly less than of 2½ or 3 ft. lengths of 6 in. t.c. pipe, with no maintenance cost whatever.

Supervision of sewerage is divided in Holland, Mich., the sanitary sewer system and sewage treatment being under the supervision of the Board of Public Works, while the storm water system is under the direct supervision of the common council through the city engineer.³¹

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c, indicates construction article; n, note or short article; t, technical article.

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August 25

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California Culex Cut-Ups

California claims to be supreme in many things, but until recently we had failed to note mosquitoes in the list. In fact, we suspect that they suppressed information about them until the mosquitoes themselves were suppressed. But if an article in the Alameda Times-Star is to be believed, the mosquitoes in Alameda County were bigger and busier than ever New Jersey boasted until that county's mosquito abatement district got in its work.

Marksmen at the state rifle range complained that good scores were impossible because mosquitoes invariably perched on the gun sights before they could be leveled to position; and at the first tee of each golf course was a drum of citronella and a spray gun for spraying every player before he started, while smaller spraying outfits were carried by the caddies. Even the tough hides of the cows did not discourage these pests and the milk given by Alameda County cows contains a higher percentage of butter fat than it did when so much of their time and energy was devoted to tail swishing.

Sewage Treatment Troubles and Remedies

PERHAPS the most interesting papers and discussions at the Seventh Annual Conference of the Pennsylvania Sewage Works Association were those dealing with plant operating troubles and the remedies therefor.

Sewage being what it is, freedom from odors at treatment plants can be maintained only by eternal vigilance and cleanliness. But in addition, special conditions must be met by appropriate remedies. Odors from skimming tank scum, which was stored in a small pit while awaiting incineration, gave trouble at Erie. A. B. Cameron reported that they tested out the use of chlorine and found that, by adding from 24 to 56 ppm., a chlorine of residual 1.0 to 1.4 ppm. was obtained and odors prevented.

Frank Altemus stated that at Norristown there had been successive odors in the screen and grit room due to the return of supernatant liquor from the digestion tanks to the influent manhole. These odors were materially decreased by installing a ventilation system.

The heating coils in the Norristown digestion tanks rested on brackets and were not fastened to the walls, and when the tanks were first filled the coils floated.

E. R. Queer, Pennsylvania State College, gave an interesting report of his experiments upon the heating of sludge, the aim of which was to determine the heat transfer coefficient from a heating coil to the sludge.

The bar screen at Norristown at first allowed too many rags to pass, which clogged the sludge pump. This was remedied by decreasing the velocity of flow through the screen by installing a submerged weir below it.

Digestion of sludge was found at State College to take place fairly well at a p.H of 6.7, according to R. R. Cleland, and it was found cheaper to digest it at this p.H and then add alum to aid in drying, than to maintain a higher p.H by adding lime.

Sludge drying beds of anthracite coal have been tested at State College, with the cooperation of the Anthracite Association, and compared with sand beds; as a result, it was claimed that (1) The cost of coal per cubic yard is about the same as of sand. (2) There is less packing of coal when men walk on the beds to clean them. (3) Less coal is lost when sludge is removed. (4) Less alum is required to dry sludge on coal beds than on sand.

Charles C. Agar, New York State Dept. of Health, referring to experience in that state, described a slow sand filter onto which sewage was distributed by sprinkling filter nozzles. In another plant a septic tank was equipped with an inclined conveyor which took several days to remove the sludge from the tank.

Roy L. Phillips said that the Meadville plant, being new, had not yet experienced any troubles to mention, but cited precautions which had been taken to prevent them. These included: Large site; illumination of buildings and tanks; city water brought to plant through 6" pipe; prechlorination; pipes with small holes, through which air is blown, were placed on the bottoms of influent channels of settling tanks; 4-speed motors were used for sludge pumps; sludge concentration and conditioning tanks were provided; and ground slopes around digestion tanks were planted with creeping vines.

J. K. Hoskins, U. S. Public Health Service, in a paper discussing oxygen demand, gave a formula for calculating the population equivalent of industrial wastes:

$$P = \frac{F X}{81,940 C} \text{ in which } P = \text{population equivalent,}$$

F=flow in gpd, X=5-day BOD, and C=population.

In a paper on vacuum filters, E. D. Flynn, Oliver United Filters, said that the cost of filtering sludge compared favorably to digestion and drying for plants of 800 to 2,000 or more cu. ft. of sludge per day; and that a large percentage of the cost was that of conditioning chemicals, which cost it was hoped would be reduced. But L. L. Hedgepeth, Pennsylvania Salt Mfg. Co., said that the cost of chemicals probably would never be lower, and reduction of conditioning cost must therefore be obtained by devising more efficient ways of using them.

Rubber for Subaqueous Water Mains

The municipal water engineer of Singapore, D. J. Murnane, states in his latest annual report that he believes that the use of reinforced rubber pipe would frequently prove the most economical, efficient and permanent solution of submerged pipe laying problems. He bases this conclusion on information that an 8-in. reinforced rubber pipe laid across a river in Maryland has continued to give satisfaction, and his own experiment in Singapore with a 4-in. armored rubber pipe which was immersed in the sea from Dec. 24th, 1930, to Oct. 18th, 1932. This pipe was connected with the city water supply and kept under a pressure of 45 lbs. per sq. in., and was still in excellent condition in 1932 and withstood 100 lbs. pressure without leaking. Galvanized iron, both plain and bitumen painted, and Armco iron were used for connecting the rubber pipe to the water main, but all failed in four months or less. The rubber pipe was again immersed in October, 1932, using a copper pipe for connection.

Value of Engineering Services Demonstrated

The value of engineering services was demonstrated as long ago as 1873 in Staunton, Va. A Baltimore contractor-engineer offered to construct for the city a pump-house, pipe line and reservoir for \$90,000 in 8% bonds. When the city and water works engineer suggested making specifications a part of the contract, the Baltimore philanthropist indignantly pointed out that he offered his guarantee "to turn the job over, completed in a workmanlike manner"; further suggesting that almost as unnecessary was a waterworks engineer costing the city 10% on \$12,000 a year. However, this engineer was permitted to prepare specifications and obtain bids thereon, and another contractor completed the work satisfactorily in accordance therewith for \$73,000 in 8% bonds. "The moral of this story for water works engineers is: if anybody says you are unnecessary, check his figures."

Books and Booklets

Hypo-Chlorination of Water:

Publication of "Hypo-Chlorination of Water," a 72-page handbook of water works practice, has just been announced by The Mathieson Alkali Works (Inc.), manufacturers of H T H, liquid chlorine, and other chemicals for water works use. Walter L. Savell, of the Mathieson technical staff, is author of the volume.

The new handbook summarizes a wide range of water works problems, with specific advice for their solution. Particular emphasis, however, is placed upon the widened range of usefulness for the modern dry chlorine carrier as a source of hypochlorite solutions, and hypo-chlorination is defined as the scientific application of such treatment. Practical procedure is outlined for such purposes as safeguarding of smaller water supplies, eliminating algae troubles, conditioning filters, sterilizing new mains and meeting emergencies. A digest of the hypochlorite feeding equipment of fifteen manufacturers is included. More than forty illustrations and a complete index add to the practical value of the handbook.

Copies of "Hypo-Chlorination of Water" may be obtained free of charge by water works men from The Mathieson Alkali Works (Inc.), 250 Park Avenue, New York, N. Y., or through Public Works.

All About Pumps and Pumping Equipment:

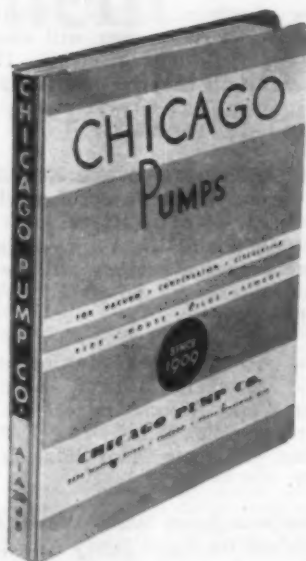
Complete information and engineering data on pumps and pumping equipment is contained in a 400-page catalog being distributed by the Chicago Pump Company, 2300 Wolfram Street, Chicago, Illinois. The catalog consists of about forty individual bulletins, each confined to one particular line of pumps or equipment, all bound together in an attractive, strong, loose-leaf binder. It has been called the most complete pump catalog ever published.

A special bulletin in the catalog tells how to select a pump for a given service. Much valuable information on pumps and hydraulics and engineering tables have been brought together in this one bulletin for ready reference.

Each bulletin contains tables and engineering data pertaining to that particular line of pumps. The tables give capacities, discharge heads, motor horsepower requirements, and other valuable engineering data. It required much painstaking time of expert engineers and cost thousands of dollars to compile these tables, alone.

The catalog thoroughly describes and illustrates the following complete line of pumps and pumping equipment manufactured by the Chicago Pump Company:

Sewage Ejectors, Bilge or Sump Pumps, Electric Cellar Drainers, Screw-Feed Sludge Pumps, Horizontal Centrifugal Pumps, Hot or Cold Water and Brine, Circulating Pumps, Vacuum



Heating Pumps, Condensation Pumps, Pneumatic Water Systems, Automatic Alternators for Duplex Pumps to transfer the operation automatically from one pump to the other, Aerators, Liquid Samplers, Comminutor or Chopper Screens, Speed Screens, Water Seal Pumps.

Analysis of Rigid Frame Concrete Bridges:

This 32-page booklet, published by the Portland Cement Association, Chicago, Ill., is a condensed treatise on modern rigid frame analysis, and contains the latest data from numerous sources. Unwieldy mathematics are replaced with simple and rapid methods without loss of accuracy. We recommend this booklet to every engineer interested in bridge construction.

Duroline Cement-Lined Pipe:

A bulletin covering the characteristics of Duroline cement-lined pipe, which is manufactured by the National Tube Co., Pittsburgh, Pa., has been issued by that company. Duroline is said to have about one-third the solubility of usual portland cement linings, being especially resistant to corrosion. The smooth inner surface gives a coefficient of discharge (C) for the Hazen & Williams formula of 148. Adequate protection for joints is provided. Very complete information is given in Bulletin 28, which may be obtained on request.

Cranes and Shovels:

Link-Belt models K-38, 44, and 55 are covered in three attractively illustrated eight-page 8 1/2" x 11" folders recently issued by Link-Belt Company, 300 West Pershing Road, Chicago, on Crawler-Mounted Shovel, Crane, Dragline Equipment. Lifting capacities, clearance diagrams and other data are given. Copies will be mailed upon request.

Chain Belt Pumps:

The Chain Belt Company, Milwaukee, has prepared a new 16 page-catalog, bulletin No. 240, covering their line of Rex Speed Prime pumps.

Some of the most useful data ever placed in the hands of the pump user will be found in this Chain Belt book. A sample problem has been prepared, accompanied by the necessary simplified charts and tables, to enable the contractor or other pump user to "figure" the right pump for his particular job. The illustrations on both the cover and inside are exact, or nearly exact, reproductions of the unit as far as appearance is concerned. This makes a most attractive pump handbook. These pumps are equipped with the Rex clean-out valve and the Rex patented "Peeler." To the "Peeler" is given the credit for the greatly increased air handling capacity of the Rex.

The Chain Belt line of Speed Prime pumps are painted in a metallic bronze paint, a very attractive and lasting finish. They are made in 2", 3", 4" and 6" sizes with capacities ranging from 10,000 to 90,000 gallons of water per hour.

Weighing Feeders:

A recently issued bulletin No. 33B, of the Hardinge Company, Inc., York, Pa., describes the Hardinge Constant Weight Feeder. This feeder regulates feed by weight, not volume, is easy to install, low in cost and can handle dry or moist materials, including lumps of some materials containing as high as 22% moisture and in a wide range of feed size, at constant rate and accuracy.

On one page of the bulletin, there is a diagrammatic sketch clearly showing the principle of operation.

General dimensions of various sizes, applications, capacity tables, photographs of installations, etc., are also given.

Control attachment for shutting off motor and signalling operator when bin supplying feeder becomes empty and other unusual features are described.

Bars, Shapes and Plates:

The Inland Steel Company, Chicago, has just published a new booklet on bars, shapes, plates and semi-finished steel entitled: "Sizes We Roll and Standard Extras." It incorporates all the up-to-date changes in extras. It also includes tolerances, and size data on the products of Inland's bar, plate and structural mills. This edition is of a new and larger size—3 3/4 x 8 1/2 inches.

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Engineering Meetings

New England Water Works Association:

The 52nd Annual Convention of this association was held at Bridgeport, Conn., Sept. 19-22. E. Sherman Chase of Boston was elected president, Roger W. Esty, Danvers, vice president, and Albert L. Sawyer, Haverhill (since deceased) treasurer. To Charles W. Mowry of Boston was awarded the Dexter Brackett Memorial medal for the best paper of the year.

The papers presented were of a high order and included, in addition to the detailed description of the Bridgeport Water Supply system, and report of a study on rainfall of southern New England by Caleb Mills Saville of Hartford, an interesting account of a study of New York state's typhoid outbreaks, presented by Earl Devendorf, associate director of the Division of Sanitation of that state.

Other speakers included E. T. Killam, Alexander Potter, Gordon M. Fair, L. H. Enslow, E. L. Bean, R. J. Newson and L. G. Carleton.

The American Road Builders' Association:

It has been decided definitely that there will be a 1934 Annual Convention and Road Show of the ARBA. The Road Show will be in the form of a hotel exhibit. The dates, place and other details will be announced later.

Other Meetings:

The Ohio Conference on Sewage Treatment will be held at the Elks club, Findlay, O., Oct. 19 and 20. The program will include, Relation of NRA to Sewage Treatment Projects, by F. H. Waring; Operation of the Lima Activated Sludge Plant, by W. S. O'Brien; Mechanical Drying & Incineration of Sludge; Observation on Sewage Treatment in Germany, by C. B. Hoover; A Comparison of Sand and Grass Filters for Clarifying a Trickling Filter Effluent, by A. H. Fretter; Operation Features of Revolving Distributors, by G. Hall; Description of the Findlay Sewage Treatment Plant, by B. H. Barton.

T. C. Schaetzle, 1200 Berwin St., Akron, O., is president of the conference.

The Virginia Water and Sewage Works Ass'n will hold the fifth annual conference Nov. 13 and 14 at Newport News, Va., with headquarters at Hotel Warwick. E. F. Dugger, General Manager of the Newport News Water Works Commission will preside. Chris F. Bingham, Filtration Division, Dept.

of Public Utilities, Richmond, Va., is treasurer and can furnish further information.

The Southern Section, American Water Works Association, will meet in Augusta, Ga., during April, 1934. Further details may be obtained from W. H. Weir, Secretary-Treasurer, 138 Capitol Bldg., Atlanta, Ga.

The fall meeting of the New York State Sewage Works Association will be held Oct. 27-28 at the Roger Smith Hotel, White Plains, N. Y. Westchester County sewerage projects will be described, discussed and visited. A. S. Bedell is secretary.

The Seventh Annual Meeting of the Rocky Mountain Section, American Water Works Association, will be held in Denver, Colo., Oct. 24-26. Dana E. Kepner, 437 State Office Bldg., is secretary.

The New Jersey Water Works Association and the South Jersey Association of Water Superintendents will meet in conjunction with the New Jersey State League of Municipalities at the Berkeley-Carteret Hotel, Asbury Park, N. J., October 5.

Our readers are invited to furnish us with early information of technical meeting dates, the subjects to be discussed and reports of such meetings.

Combination Scraper and Sheepsfoot Roller:

After a test of more than three months in actual service over a variety of soils, rocks and shales, R. G. LeTourneau, Inc., have announced a combination 9-yard Carry-All Scraper and Sheepsfoot roller.

The new tool was developed at the request of Fredrickson & Watson, contractors, to save the expense of operating a separate tractor and scraper on fills. It was designed for use on this firm's grading contract on the Lebec-Gorman section of the Ridge Route Alternate, an important highway now being built to connect northern and southern California, through the Tehachapi mountains. In the contract, the state highway authorities specified a uniform spread of material on fills, with compacting by sheepsfoot rollers.

The combined roller and tractor met state specifications for weight and construction.

Action of the roller is dependent on the position of the scraper. When the scraper bowl is lowered to pick up its load, the roller is lifted clear of the ground. Raising the bowl of the scraper into position for

Personal Notes

William J. Titus, formerly chief engineer of the Indiana State Highway Department, has been appointed senior highway engineer of the Bureau of Public Roads. For the present, he will be in charge of all grade separation and bridge work in Illinois, Indiana, Kentucky and Michigan.

James T. Castle, 424 First Ave., Pittsburgh, Pa., has been appointed district representative by Roots-Cornerville-Wilbraham, Cornersville, Ind., manufacturers of blowers, pumps, meters, etc.

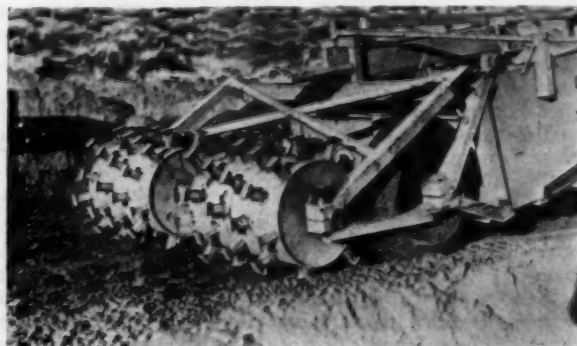
A. M. Andresen is manager of the new branch office opened by the Chicago Pneumatic Tool Co. at 1028 South Sixth Avenue, Seattle, Wash.

Frederick D. Rogers, 80 Federal St., Boston, Mass., will handle the sales of Coppus blowers, ventilating equipment, air filters, etc., for the Coppus Engineering Co., Worcester, Mass.

William T. Conlon has been appointed manager of the Industrial Department of the Superheater Co., New York City.

the haul still leaves the roller clear so that the load is carried on the scraper wheels, but when the scraper is drawn out onto the fill the operator lifts the scraper bowl somewhat higher and the roller comes in contact with the ground.

By varying the bowl position different portions of the combined weight of roller, scraper and load can be thrown onto the roller. In working back and forth over the fill the roller can be kept in working position constantly if desired. Compaction tests made after use of this combination on the Fredrickson & Watson fills were entirely satisfactory. At no time was any difficulty experienced in operation of the new tool, which withstood the entire three months of very hard usage without sign of wear or distortion.



Combination Scraper and Sheepsfoot Roller.

Readers' Service Department

To help you in your work, any of this **INDUSTRIAL LITERATURE** will be sent **FREE** upon request.

It is a good practice to check this list regularly because descriptions of new bulletins are always being added.



Construction Materials and Equipment

Asphalt Heaters

8. A 32-page general catalog issued by Littleford Bros., 452 E. Pearl St., Cincinnati, Ohio, describes and illustrates their complete road maintenance line, including tar and asphalt kettles, surface heaters, oil burners, sand dryers, tool boxes, lead and compound furnaces, tool heaters, asphalt Heater Co., Frankfort, N. Y.

9. Illustrated manual No. 11 describes "Hotstuf," the master oil burning heater. The only heater with patented elevated melting chamber for Asphalt, Tar and all bitumens used in road and street construction and maintenance, roofing, water proofing, pipe coating, etc. Mohawk Asphalt Heater Co., 94 Weaver St., Schenectady, N. Y.

Asphalt Mixing Plants

10. Precise engineering control of bituminous pavement construction is provided at low initial cost by the new Blaw-Knox (Madsen) portable asphalt mixing plant which is described and illustrated in a new catalog just issued by Blaw-Knox Company, 2019 Farmers Bank Building, Pittsburgh, Pa.

Asphalt Plants

11. A very complete 24 page booklet covering all five sizes and types of Iroquois Asphalt Mixing Plants which are particularly adapted to meet the needs of municipalities and contractors, providing maximum output at minimum cost. Barber Asphalt Co., 1600 Arch St., Philadelphia, Pa.

Concrete Accelerators

30. "How to Cure Concrete," a forty-seven page manual published by the Dow Chemical Company, Midland, Michigan, treats fully subjects suggested by title.

31. "Curing Concrete Roads with Solvay Calcium Chloride," 30 page booklet, comprehensive. Contains tables, illustrations, suggestions for testing devices. Covers the subject in considerable detail. Solvay Sales Corp., 61 Broadway, N. Y. C.

35. "A report on Current Practice of using Calcium Chloride for curing Concrete Pavements, Bridges, Culverts and Concrete Products." It includes reports from the Highway Research Board, the Bureau of Public Roads and State Highway Departments. Columbia Products Co., Barberton, Ohio.

Concrete Mixer

44. Concrete Mixers, both Tilting and Non-Tilting types, from 3 1/2 to 84s size, The Jaeger Machine Company, Columbus, Ohio.

Crushers

57. Up-to-date information on Stone Crushers, Stone Spreaders, Unloaders, Drags and other contractors' equipment from the Gallion Iron Works & Mfg. Co., E. Jeffrey Mfg. Co., Columbus, Ohio.

Culverts

60. "In diameters up to 10 feet and larger" just issued by the Armco Culvert Mfrs. Assn., tells a good deal about drainage problems and their solution. 32 pages about drainage and multi-plate culverts.

Explosives

74. "Use of Explosives for Settling Highway Fills. A new booklet which fully explains by diagrams and charts the three methods developed after many tests by the Du Pont engineers, which singly or in combination will quickly and efficiently

do your job. Just issued by E. I. Du Pont de Nemours & Co., Inc., Explosives Dept., Wilmington, Del.

Graders

76. Latest information about Gallion Motor Patrol Graders, Road Maintainers and Leaning Wheel Graders with hydraulic control is contained in a new series of illustrated catalogs, Nos. 125, 130, 135 just issued by the Gallion Iron Works & Mfg. Co., care of The Jeffrey Mfg. Co., Columbus, Ohio.

78. The No. 101 Austin Leaning Wheel Grader is completely described and illustrated in Bulletin No. 1238 which shows operation of Z-Bar, back sloper, bank cutter, etc. Published by The Austin-Western Road Machinery Co., 400 North Michigan Ave., No. A5, Chicago.

79. Four new bulletins have just been issued describing and illustrating the Austin No. 77 Motor Grader. Contain construction details, specifications and weights. The Austin-Western Road Mach. Co., 400 N. Michigan Ave., No. A5, Chicago, Ill.

Hose and Belting

87. Complete information on rubber hose and belting for all types of contracting and road building service. The Government Sales Department of the Good-year Tire & Rubber Co., Inc., Akron, Ohio.

Joint Filler and Line Marker

88. Bulletin No. G-9 issued by Littleford Bros., 452 E. Pearl St., Cincinnati, Ohio, describes and illustrates their new No. 91 Joint Filler which is used to fill horizontal and center joints with hot asphalt. It can be equipped to apply an asphaltic center line as it fills the center joint. This bulletin also describes the Littleford Traffic Line Marker.

Joint Filling Pot

89. A supplement to Bulletin No. E-5 has been issued by Littleford Bros., 452 E. Pearl St., Cincinnati, Ohio, describing their cone-shaped crack filling pot No. 86-B. The chief feature of this pot is that it is springless—there is no mechanism to get out of order. It is used to fill cracks and joints in concrete pavements and interstices in brick or granite block pavements.

Loaders and Unloaders

97. Portable Loaders and Unloaders. Folders: Nos. 1248, 1298 and 1074 cover Belt Conveyors with channel iron and truss types of framework; No. 1076, Portable Bucket elevators for different classes of work; and No. 1256, the "Grizzly" Crawler Loader for heavy work and large capacities. Link-Belt Company, Philadelphia.

100. Materials Handling and Positive Power Transmission Equipment, giving technical data, list prices and illustrations of this machinery. Link-Belt Co., Chicago, Ill. General Catalog No. 500.

Motor Trucks

105. Full information about their complete line of motor trucks, all powered by six-cylinder "truck-built" engines of uniform valve-in-head design, will be sent promptly. General Motors Truck Co., Pontiac, Mich.

Paving Materials

109. A 36-page booklet with 66 illustrations has just been issued by the Barrett Co., giving full information regarding the making, laying and maintaining of "Tarvia-lithic," the ready-to-lay pavement.

111. "Tarvia Double Seal Pavements." Shows, step by step, the construction of a Tarvia pavement. 24 pages. The Barrett Company, 40 Rector Street, New York.

112. Complete directions for surface Cut Back Asphalt are contained in a 36 treatment and bituminous surfacing with page data book. Standard Oil Co. of Indiana, 910 So. Michigan Ave., Chicago, Ill.

Road Machinery

126. A new picture book of the Austin-Western Line of road machinery showing the application of road graders, road rollers, elevating graders, crawler and wheeled wagons, crushing and screening plants, shovels, cranes and excavators, scarifiers and many small tools, is contained in Catalog No. 1247. Copies available on request at The Austin-Western Road Machinery Co., 400 North Michigan Ave., No. A5, Chicago.

127. "Road Machinery Illustrated." New illustrated bulletins on the motor rollers, three-wheel and tandem rollers, motor graders powered by Caterpillar, Twin City, Cletrac, McCormick-Deering and Ford-

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10-33

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son tractors, and straight and leaning wheel graders. Gallion Iron Works & Mfg. Co., Gallion, O.

Rollers

132. A 32-page book in four colors featuring a complete line of road rollers. 8 3/4 x 11, leatherette cover, numerous action pictures. Buffalo-Springfield Roller Co. of Springfield, Ohio.

133. 20-page pocket size booklet showing all types of Buffalo-Springfield motor rollers and scarifiers and their uses.

134. "The Chief," a six cylinder roller of advanced design and construction is fully described in an illustrated catalog just issued by the Gallion Iron Works & Mfg. Co., care of The Jeffrey Mfg. Co., Columbus, Ohio. Gives complete details of the very latest development by this company.

Sand and Gravel Washing Plants

140. Seventy-page catalog giving complete information regarding Sand and Gravel Washing Plants, stationary and portable. Those interested in such equipment should have a copy. Link-Belt Co., Chicago, Ill.

Shovels, Cranes and Excavators

145. The Austin Badger, a new, fully convertible 3/4 yard crawler shovel, made by The Austin-Western Road Machinery Co., 400 North Michigan Ave., No. A5,

Chicago, is fully described and illustrated in their Bulletin No. 1236.

146. Link-Belt Co., Chicago, Ill., has issued Book No. 1095, which describes and illustrates their complete line of Gasoline, Electric, or Diesel operated shovels, cranes and draglines. 910 S. Mich. Ave.

Steel Posts

160. Steel Posts for highway guard rails, fences and other purposes. Catalog and data book. Sweet's Steel Company, Williamsport, Pa.

Tires, Truck and Tractor

165. Speed and economy in use of solid, cushion and pneumatic tires and tubes for trucks, cars, tractors, graders and other road machinery. Government Sales Department of the Goodyear Tire & Rubber Company, Inc., Akron, Ohio.

Tool Boxes

167. Bulletin No. G-6 issued by Littleford Bros. 452 E. Pearl St., Cincinnati, Ohio, describes and illustrates the Hand-DeeBox, a portable tool box of all steel construction. This tool box is equipped with a special locking device that locks both covers at the same time. No padlocks are used. Littleford trailers, lead melting furnaces, and "Hot Dope" Kettles for pipe coating are also described in this bulletin.

418. Sewage screens (Tark, Brunotte, and Straightline) for fine and coarse sewage; Straightline Collectors for Settling Tanks (Sludge, Scum and Grit), and Mechanical Aerators for activated sludge plants. Link-Belt Company, 910 So. Michigan Ave., Chicago, Ill. Book 642.

419. An illustrated booklet showing installations, and complete details regarding the 19 exclusive improvements which are featured in Shevlin Fine Disc Screens will be sent promptly by the Shevlin Engineering Co., Inc., 227 Fulton St., New York, N. Y.

420. A useful new bulletin for all those interested in sewage disposal, describing some of their proven equipment such as self-cleaning bar screens, grit conveyors, sludge collectors and shredders, has just been issued by the Jeffrey Mfg. Co., Columbus, Ohio. Includes diagrams and many illustrations.

Screens

424. Water Screen Book No. 1252, describes water screens and gives complete technical information about them. Link-Belt Co., Chicago, Ill.

Sludge Bed Glass Covers

426. Sludge Bed Glass Covers—"Super-Frame." Hitchings & Co., Main Office, Elizabeth, New Jersey. Offer A. I. A. File 101SB, describing glass covers for sludge and sprinkler beds; details, specifications and cost data.

Sludge Conditioning

331. Full information concerning the experiences in the use of ferric chloride for use in sludge conditioning and in coagulating sewage will be sent promptly by Innis, Spelden & Co., 117 Liberty St., New York, N. Y.

Treatment

429. A new series of bulletins describing their full line of sewage treatment equipment—Fine Screens, Schofield Bar Screens, Vacuum Filters for Sewage Sludge, Decarie Screenings Incinerators, Schofield Bar and Fine Screens, Vacuum Filters for Sewage Filtration and Pneumatic Ejectors for Sewage Screenings—are ready for distribution on request to Municipal Sanitary Service Corp., Room 2703, 155 East 44th St., New York, N. Y.

430. Separate bulletins showing their many lines of sewage treatment equipment will be sent promptly by The Pacific Flush Tank Co., Chicago and New York. The latest is No. 110 describing tray clarifiers.

431. Eliminate sludge bed troubles, forget about weather conditions, odor nuisance, hail insurance and the like. Full details as to how Oliver United Vacuum Filters overcome these problems will be sent to all interested by Oliver United Filters Inc., 33 West 42nd St., New York, N. Y.

433. Collectors and concentrators for modern sewage treatment plants, recent installations, and full data on aerators, and screens. Link-Belt Co., 910 So. Michigan Ave., Chicago, Ill., and Philadelphia.

Snow Removal

344. "Control Winter Drifts"—A new folder giving full details regarding use and construction of the Mattson snow fence has just been issued by the Mattson Wire & Mfg. Co., Peoria, Ill. Illustrated in two colors.

345. "Standard and Heavy Duty Reversible Blade Snow Plows for Motor Trucks," a new bulletin just published by the Monarch Mfg. Co., East Front St., Wilmington, Del. Illustrated. Contains complete descriptions and specifications.

349. "The Answer to the Snow Removal Problem." It gives full details of the Frink type S snow plow for trucks. Carl Frink, Mfr. of Clayton, N. Y.

359. Gallion Iron Works and Mfg. Co., Gallion, Ohio. Details, prices and catalogs of their snow plows adaptable to any make of truck.

Sanitary Engineering

Activated Carbon, Aqua NUCAR

330. For low cost removal of tastes and odors from potable waters. Used by more than 400 municipalities. For literature address Industrial Chemical Sales Company, Inc., 230 Park Avenue, New York.

331. Proportioner's Inc., 737 N. Michigan Ave., Chicago, describe in an 8 page folder their mechanical devices for controlling accurately and automatically the flow of fluids used for treatment of water supply and sewage. Ferr-O-Feeder—diaphragm pump for Ferric-Chloride or other corrosive fluids; Chlor-O-Feeder for Hypochlorite solutions. Write for a free copy.

Ferric Chloride

332. Full information concerning the experiences in the use of ferric chloride for use in sludge conditioning and in coagulating sewage will be sent promptly by Innis, Spelden & Co., 117 Liberty St., New York, N. Y.

333. Loughlin Clarifying Tanks for the more complete removal of suspended solids from sewage and industrial wastes at lower cost are described in a new bulletin just issued by Filtration Equipment Co., 350 Madison Ave., New York, N. Y.

Sludge Drying

335. Relatively dry cake sludge in demand for fertilizer is produced by automatic continuous vacuum filters like those used in Milwaukee, Houston, Chicago, Gastonia, N. C., Charlotte, N. C. Write for literature. Oliver United Filters Inc., 33 West 42nd St., New York, N. Y.

Activation and Aeration

390. A booklet of value to sanitary and chemical engineers describes Norton Porous Mediums of bonded fused alumina (strong chemically stable, uniformly permeable) and their use in aeration of water and sewage. Norton Co., Worcester, Mass.

Glass Covers

393. Full details regarding the use of Lord & Burnham Glass-Covers at Dayton, Ohio; Highland Park, Ill.; Fostoria, Ohio; and Bloomington, Ill. are given in bulletins Nos. 10, 11, 14, 15. Issued by Lord & Burnham, Irvington, N. Y.

Joining Materials

401. G-K Compound for vitrified clay

sewers, MINERALEAD for bell and spigot water mains, also M-D Cut-Ins for making house connections. Atlas Mineral Products Company, Mertztown, Pennsylvania.

402. Full details concerning No. 1 Korite for sealing sewer pipe joints so that they will be permanently tight. Standard Oil Co. of Indiana, 910 So. Michigan Ave., Chicago, Ill.

Manhole Covers and Inlets

403. Nuisance from loose, noisy manhole covers is eliminated by the use of Westeel rubber cushioned manhole covers and gratings. Six special advantages are explained in a new illustrated bulletin just issued by the West Steel Casting Co., 805 East 70th St., Cleveland, Ohio.

404. Street, sewer and water castings made of wear-resisting chilled iron in various styles, sizes and weights. Manhole covers, water meter covers, adjustable curb inlets, gutter crossing plates, valve and lamphole covers, ventilators, etc. Described in catalog issued by South Bend Foundry Co., South Bend, Ind.

Meters, Sewage and Water

405. Just issued. Every sanitary engineer should have a copy of this new 32 page booklet describing the applications, types and distinctive features of the new Bailey meters for sewage treatment and water supply. Sent promptly. Bailey Meter Co., 1027 Ivanhoe Road, Cleveland, Ohio.

Pipe Forms

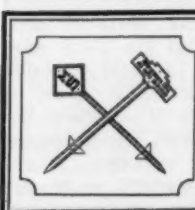
407. Making concrete pipe on the job to give employment at home is the subject of a new booklet just issued by Quinn Wire and Iron Works, 1621 Twelfth St., Boone, Ia., manufacturers of "Heavy Duty" Pipe Forms. Sent promptly on request.

Pumping Engines

413. "When Power Is Down," gives recommendations of models for standby services for all power requirements. Sterling Engine Company, Buffalo, N. Y.

Screens, Sewage

417. The simple, automatic, Loughlin self-cleaning traveling screen is fully described in a new bulletin just issued by Filtration Equipment Co., 350 Madison Ave., New York, N. Y.



Sweet's
Steel Co.
Williamsport
Penna.

SWEET'S
You can't use stronger, more durable or better
weather resisting steel posts for your fence re-
quirements than Sweet's Steel Posts—
STEEL POSTS

Write
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Descriptive
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New Equipment in Pictures



Weighing approximately 1800 lbs. but very strong, this simplified bulldozer with high lift and very low undercut is built by Austin-Western Road Machinery Co. to match the full power of a Cletrac 35. Very simple to attach, and may be removed or replaced quickly and easily.

New Bates Diesel Oil Burner

A new track type tractor for the burning of low gravity fuel has been announced by the Bates Manufacturing Company, Joliet, Illinois. This tractor develops approximately 38 horsepower on the drawbar. It is powered by a four-cylinder Waukesha Hesselman oil burning engine.

The motor used in the Bates "35" can handle any common commercial fuel oils found anywhere in the world market, being limited by only one condition—viscosity—fuels must flow readily through the injection system at the surrounding operating temperature.

The incorporation of spark plug ignition with low gravity oil pump fuel injection does away with the necessity

of employing an auxiliary engine to start the main power unit. In fact, this engine can be started by a hand crank with no more difficulty than starting the ordinary gasoline engine.

This Bates "35" oil burning tractor is equipped with either 12" or 14" wide tracks and has forward speeds of 1 3/4-3 3/4 m.p.h. The dimensions of the tractor are: Length, 120"; height, 70"; width, 72"; ground clearance, 12".



Handling and using the Wheeled Roller.

The Wheeled Roller:

This is a device quite in the spirit of the times and is especially suited to small jobs, maintenance work, etc. You can take your roller to the job at truck speed—and away from the job, too.

It weighs about 3,900 pounds, or 108 pounds per lineal inch. Sand, water, etc., can be added, increasing the weight to as much as 160 pounds per lineal



The recently developed McCormick-Deering enclosed gear mower, when mounted on balloon tires, as shown above, is especially suited for mowing shoulders on hard surface highways.

inch. Also can be equipped with water tank and swab for rolling asphalt.

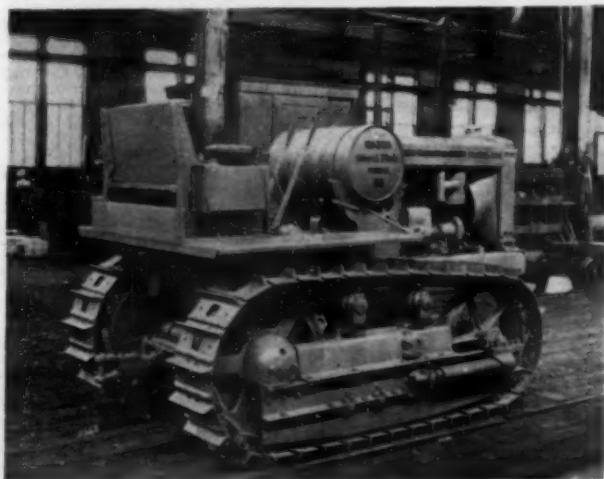
By lifting the tongue drawbar up and over, the wheeled roller is converted from a trailer to a roller. It is manufactured by The Wheeled Roller Corp., San Antonio, Texas. Detailed information on this equipment which is especially suited for county and city work will be furnished gladly by the manufacturer or the editor of this magazine.

Mowing Across Fences:

The Toro Highway mower, manufactured by the Toro Co., Minneapolis, Minn., can cut behind guard rails and fences, on steep slopes and in other difficult places. It consists of a power driven sickle with a cutter bar attached to a steel frame carrying the motor, all mounted on a pneumatic tired tandem wheeled carrier.

It is said it will cut at any cutting angle, so that, by means of an extension, it will cut clear down to the foot of a fill slope, cut the ditch, and up the other slope if there is one. Runs from a truck, tractor or light car.

It is impossible within the limits of space available to tell about this machine. Further information from the manufacturer or the editor upon request.



The Bates Diesel Oil Burner.



The Toro mows across fences.

Need Special Information? Use this Readers Service

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Road and Street Maintenance

Asphalt Heaters

8. A 32-page general catalog issued by Littleford Bros., 452 E. Pearl St., Cincinnati, Ohio, describes and illustrates their complete road maintenance line, including tar and asphalt kettles, surface heaters, oil burners, sand dryers, tool boxes, lead and compound furnaces, tool heaters, asphalt tools, joint and crack fillers, squeegee carts, etc.

Asphalt Mixing Plants

10. Precise engineering control of bituminous pavement construction is provided at low initial cost by the new Blaw-Knox (Madsen) portable asphalt mixing plant which is described and illustrated in a new catalog just issued by Blaw-Knox Company, 2019 Farmers Bank Building, Pittsburgh, Pa.

200. For general construction and maintenance, the Original Improved "Hotstuf" Asphalt Heater, an economical oil burning heater, Mohawk Asphalt Heater Co., 56 Weaver St., Schenectady, N. Y.

Bituminous Material Handling

201. "Handling Bituminous Road Materials." This is a new and valuable booklet covering handling and heating of bituminous materials for low cost road construction and maintenance. Full data regarding Cleaver-Brooks equipment. Cleaver-Brooks Co., 740 North Plankinton Ave., Milwaukee, Wis.

Dust Control

210. "How to Maintain Roads," by the Dow Chemical Company, Midland, Michigan, is a manual dealing thoroughly with dust control, road building and maintenance.

211. "Dust Control," a concise, handy pocket reference on control of dust by use of 3C Calcium Chloride. Illustrated. Issued by the Columbia Products Company, Barberton, Ohio.

212. "Wyandotte Calcium Chloride Prevents Dust the Natural Way," a publication, fully illustrated, treating on Dust Control, economical road maintenance and methods of application, issued by the Michigan Alkali Company, 10 E. 40th St., New York City.

Dust Laying

213. Full information regarding the use of Solvay Calcium Chloride for effectively laying dust. The booklet, "Solvay Calcium Chloride, a Natural Dust Layer," 24 pages, 5½x8, covers application, economics, etc. Sent without cost. Solvay Sales Corporation, New York.

Emulsion Sprayers

214. A complete line of emulsion sprayers is described in Bulletin No. G-5 recently issued by Littleford Bros., 452 E. Pearl St., Cincinnati, Ohio. Littleford Emulsion Sprayers will spray any type of asphalt emulsion used for penetration patch work or curing concrete. They are also used to spray silicate of soda and weed exterminators.

Surface Heaters

220. The "Hotstuf" three in one, combination Tool, Asphalt and Surface heater is described and its use illustrated in Bulletin 16. Mohawk Asphalt Heater Co., 56 Weaver St., Schenectady, N. Y.

Road and Paving Materials

Bituminous Materials

226. Full details concerning the uses and advantages of Lincolnite Pulverized Petroleum Asphalt, Linco Road Oils, Cut-back Asphalt Cement and Penetration Asphalt Cements will be sent free on request by Lincoln Oil Refining Co., Box 251, Robinson, Ill.

227. "Asphalt for Every Purpose," a 44-page illustrated booklet describing Stanolind Asphalt products. Standard Oil Co. of Indiana, 910 So. Michigan Ave., Chicago, Ill.

228. A new booklet has just been issued by The Barrett Co., 40 Rector St., New

York, describing and illustrating the uses of each grade of Tarvia and Tarvialithic. 32 excellent illustrations.

229. A new series of concise and authoritative manuals of construction covering the latest developments in road-mix and surface treatment types as well as the standard asphalt pavements. These contain the best that has been developed by study, research and practical application in all types. Manual 1—Road-Mix Types is now ready for distribution. The Asphalt Institute, 801 Second Ave., New York, N. Y.

229A. Surface Treatment Types, Asphalt Road Construction Manual No. 2. Full details on surface treatments. 14 chapters, 128 pages. The second of those tremendously valuable and handy little manuals put out by the Asphalt Institute, 801 Second Avenue, N. Y. Sent on request.

Brick, Paving

230. Full information and data regarding the use of vitrified brick as a paving material, cost, method of laying, life, etc. National Paving Brick Manufacturers' Association, National Press Building, Washington, D. C.

Concrete Curing

235. "How to Cure Concrete," is a manual of instruction on the curing of concrete pavements. 47 pages. The Dow Chemical Company, Midland, Mich.

Gutters

240. "Brick Gutters and Parking Strips." A study dealing with the problems faced in the proper construction of gutters and how they can be overcome. Covers design, construction and results. Well illustrated. Just issued by the National Paving Brick Ass'n, National Press Building, Washington, D. C.

Jacking Culverts

260. No interruption to traffic, and substantial savings in construction costs are the main advantages secured by using the Armo jacking method to install conduits, drainage openings, and passage-ways under streets, highways and railroads. "The Armo Jacking Method," describing this modern means of construction and its many applications, will be sent upon request, by Armo Culvert Mfrs. Association, Middletown, Ohio. Ask for Catalog No. 7.

Maintenance Materials and Methods

270. "How to Maintain Roads," by the Dow Chemical Company, Midland, Michigan, is a manual dealing thoroughly with road building, maintenance and dust control.

275. "Tarvia-K. P. for Cold Patching." An instructive booklet illustrating and describing each step in patching a road with "Tarvia-K.P." 16 pages, illustrated, 3½x9. The Barrett Company, New York.

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U. S. Engineer Office, Montgomery, Ala. —Sealed Bids, in quadruplicate, will be received until 2:00 P. M., October 4, 1933, and then publicly opened, for furnishing all labor and materials and performing all work for the construction of two composite Jetties at New Channel entrance, St. Andrews Bay, Fla. Specifications furnished from Montgomery, Ala., and opening of bids at Mobile, Ala.

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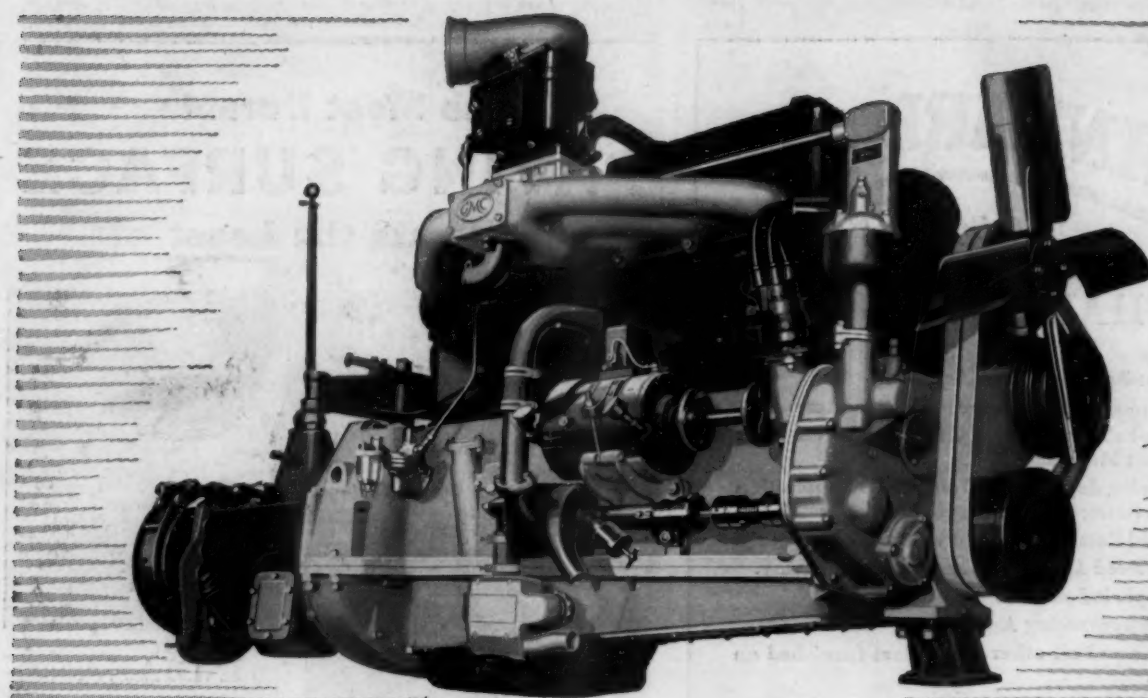
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